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FOREST RESOURCES, LUMBER INDUSTRY AND LUMBER EXPORT TRADE OF NORWAY

By

AXEL H. OXHOLM
Trade Commissioner

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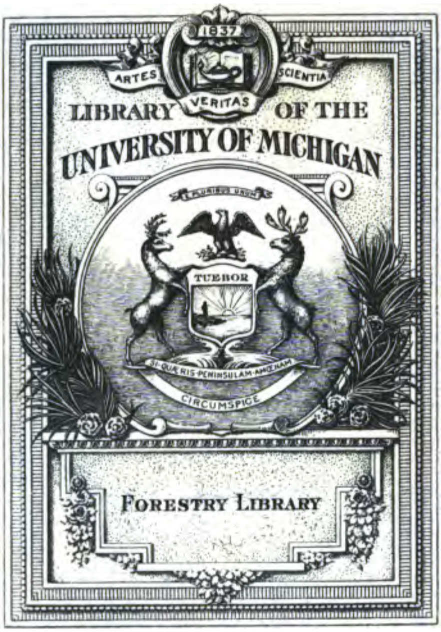

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FIG. 1.—BIRCH TREE NEAR CHRISTIANIA.

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LETTER OF SUBMITTAL.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, January 14, 1922.

SIR: Transmitted herewith is a report on the forests, lumber industry, and lumber export trade of Norway, by Trade Commissioner Axel H. Oxholm (now chief of the lumber division of the Bureau), who made an investigation and study of all branches of the lumber industry in Sweden, Finland, and Norway. His report for Sweden was published as Special Agents Series No. 195 and that for Finland as Special Agents Series No. 207.

The manufacture of lumber has been highly developed in Norway, and it is believed that the sections of the report describing the methods used in resawing and conserving wood in the production of planed lumber and box shooks, and the economies practiced in saving waste material, will be of particular interest to American lumbermen. Other sections deal with forest resources and management, logging operations, and export and import trade. The fact that Norway can ship lumber during every month of the year gives it a special position in the export trade during the winter months, when the ports of other northern European countries are closed by ice.

Mr. Oxholm acknowledges valuable assistance rendered by the Norwegian Forest Service and Bureau of Statistics during the investigation and by officers of the United States Forest Service who read the manuscript of the report.

Respectfully,

JULIUS KLEIN,
Director of Bureau.

To Hon. HERBERT HOOVER,
Secretary of Commerce.

FOREST RESOURCES, LUMBER INDUSTRY, AND LUMBER EXPORT TRADE OF NORWAY.

INTRODUCTION.

A study of the forests, lumber industry, and lumber export trade in Norway offers a great deal of interest, because many sections of the United States are confronted by the same problems that are present in Norway. The management of the Norwegian forests is now being given more attention than previously, since it is understood that the nation's welfare to a great extent is dependent upon the conservation of this natural resource. The scarcity of raw material is already felt, but the utilization of so-called waste products enables the lumbermen in Norway to derive a larger profit from lumber operations than in many other countries. In the development of wood-using industries Norway is among the leading nations of the world. From being primarily a producer of round and hewn timber, the country became an important source of sawn lumber. Later on, about 60 years ago, a part of the sawn lumber was manufactured into planing-mill products, and at the present time box shooks, sash and doors, ready-cut houses, and other similar manufactures constitute the bulk of the wood products exported.

The lumber industry was long ago superseded in importance by the pulp and paper industries, based to a great extent on a close utilization of the waste material of the logging and lumber industries.

The lumber export trade is relatively small in importance when compared with that of the other north European countries, but the Norwegian exporters have fully understood the advantage of their geographical position close to the principal markets and their ability to make shipments the year around. By specializing in c. i. f. sales, supported by the Norwegian merchant marine, the exporters have always been able readily to dispose of the lumber that the country produces for export.

The Norwegian forests have been severely taxed, especially during the war, and cut far in excess of the annual growth. For years to come it is believed that the output of lumber (rough and planed) for export will not exceed 350,000,000 feet board measure. This, however, largely depends upon the future development of the pulp and paper industries, which are the main wood-using industries in Norway. The increasing demand for raw material by the pulp factories has seriously hampered the development of lumber production.

GENERAL DESCRIPTION OF THE COUNTRY.

LOCATION AND AREA.

Norway occupies the western part of the Scandinavian Peninsula and has an area of 124,643 square miles. The area is about the same as that of Japan, Italy, or the British Isles, or the combined area of the States of Pennsylvania, New York, and Maine.

On its northeastern and eastern frontier the country borders Russia, Finland, and Sweden. The Arctic Ocean is on the north, the Norwegian Sea (a branch of the Atlantic Ocean) and the North Sea on the west and southwest, and the Skagerrack (a branch of the North Sea) on the southeast.

The country extends from 57° 57′ 31″ to 71° 11′ 8″ north latitude. The straight distance from Nordkyn to Lindesnes, which are the northern and southern extremes of Norway, is 950 miles. The straight coast line, not considering the many fiords and inlets, is about 1,835 miles. From west to east the country extends from 4° 30′ 13″ to 31° 10′ 4″ east of Greenwich, the maximum width being 243 miles in the southern part of the country. Northern Norway is very narrow, and in several sections the distance from the Swedish border to the ocean is only a few miles.

The area of Norway is thus spread over a narrow strip of land, the northernmost point being in about the same latitude as the northernmost point of the American continent and the southernmost point in the same latitude as Wrangell, Alaska. About one-half of the coast line of Norway is north of the Arctic Circle.

From the ocean numerous fiords reach into the country and extend their branches in all directions. Along the entire coast there is an almost unbroken line of islands that shelter many excellent harbors, all of which are open to navigation the year around, even in the northernmost parts of the country.

Norway is politically divided into 20 Provinces, the area of which is as follows:

Provinces.	Area of lakes.	Regions having altitude of 2,000 feet or more.	Total area.
	Acres.	*Acres.*	*Acres.*
Smaalenene	67,000		1,033,000
Akershus	83,000		1,317,000
City of Christiania			4,000
Hedemarken	307,000	1,672,000	6,799,000
Christians	283,000	4,377,000	6,237,000
Buskerud	197,000	1,998,000	3,658,000
Jarlsberg and Larvik	19,000		577,000
Bratsberg	257,000	1,796,000	3,751,000
Nedenes	142,000	1,020,000	2,309,000
Lister and Mandal	94,000	363,000	1,794,000
Stavanger	118,000	497,000	2,259,000
Southern Bergenhus	124,000	1,569,000	3,849,000
City of Bergen			9,000
Northern Bergenhus	162,000	2,045,000	4,565,000
Romsdal	99,000	874,000	3,718,000
Southern Trondhjem	196,000	1,880,000	4,618,000
Northern Trondhjem	345,000	1,262,000	5,538,000
Nordland	356,000	2,939,000	9,427,000
Tromso	132,000	2,341,000	6,665,000
Finmarken	228,000	958,000	11,861,000
Total	3,209,000	25,591,000	79,808,000

In this report the following five geographical divisions will be used: Northern Norway, the Provinces of Finmarken, Tromso, and Nordland, or the area north of 65° north latitude; Trondelagen, the area around Trondhjem Fiord; western Norway, the section south of Trondelagen; southern Norway, the territory south of 59° north latitude; and eastern Norway, the remainder of the country on the eastern slope of the mountain range running north and south through the southern part of Norway.

TOPOGRAPHY.

Norway is a mountainous country with more than one-half its area 1,600 feet or more above sea level. Only one-eighth of the country is lower than 500 feet, and at least 80 per cent of the population is in this part of Norway. More than three-fourths of the total area is unproductive land.

Along the Swedish border the Kjolen Mountain Range forms a natural boundary as far south as about 62° north latitude. South of the Trondelagen district there are several mountain ranges with a maximum height of 8,100 feet. In northern Norway the mountains are lower. The mountains are very rugged and the slopes are steep, particularly in western Norway, where they often rise abruptly from the water several thousand feet.

In the extreme south and in eastern Norway the country is sloping, and in the extreme north there are some plateaus, but nowhere in Norway is the country flat except on a narrow border, Jaederen, about 450 square miles, in the extreme south.

The area of Norway is divided as follows: Agricultural land, 3.4 per cent; forest land, 21.4 per cent; towns and cities, 0.1 per cent; unproductive, consisting of mountain pastures, mountains, lakes, glaciers, swamps, and other unproductive land, 71 per cent; inland water, 4.1 per cent.

RIVERS AND LAKES.

As in Sweden and Finland, the rivers and lakes in Norway are of great importance to the lumber industry. Norway is in a very favorable position in this regard, as the entire forest area has a network of rivers and lakes. On account of the mountainous character and the peculiar shape of the country, the rivers are not so long as in Finland and Sweden. Those of chief importance to the lumber industry are found south of 65° north latitude and principally in the eastern sections of the country. These rivers have their sources in the mountain regions of the central and southern parts and in the mountain regions on the Swedish frontier.

Only one important river, the Trysil, runs from Norway into Sweden, where it empties into Lake Wenner. It has two names, being called the Trysil River in Norway and the Klara River in Sweden. All the other important rivers empty into the ocean on Norwegian territory. In the Trondelagen and adjacent districts several small rivers run from the Swedish border westwardly and empty into the Atlantic Ocean.

In northern Norway there are few rivers of importance to the lumber industry, as these regions are only sparsely forested. The largest river in Norway is the Glommen, which runs parallel with the Swedish border and empties into the Skagerrack. It is approximately 370 miles long.

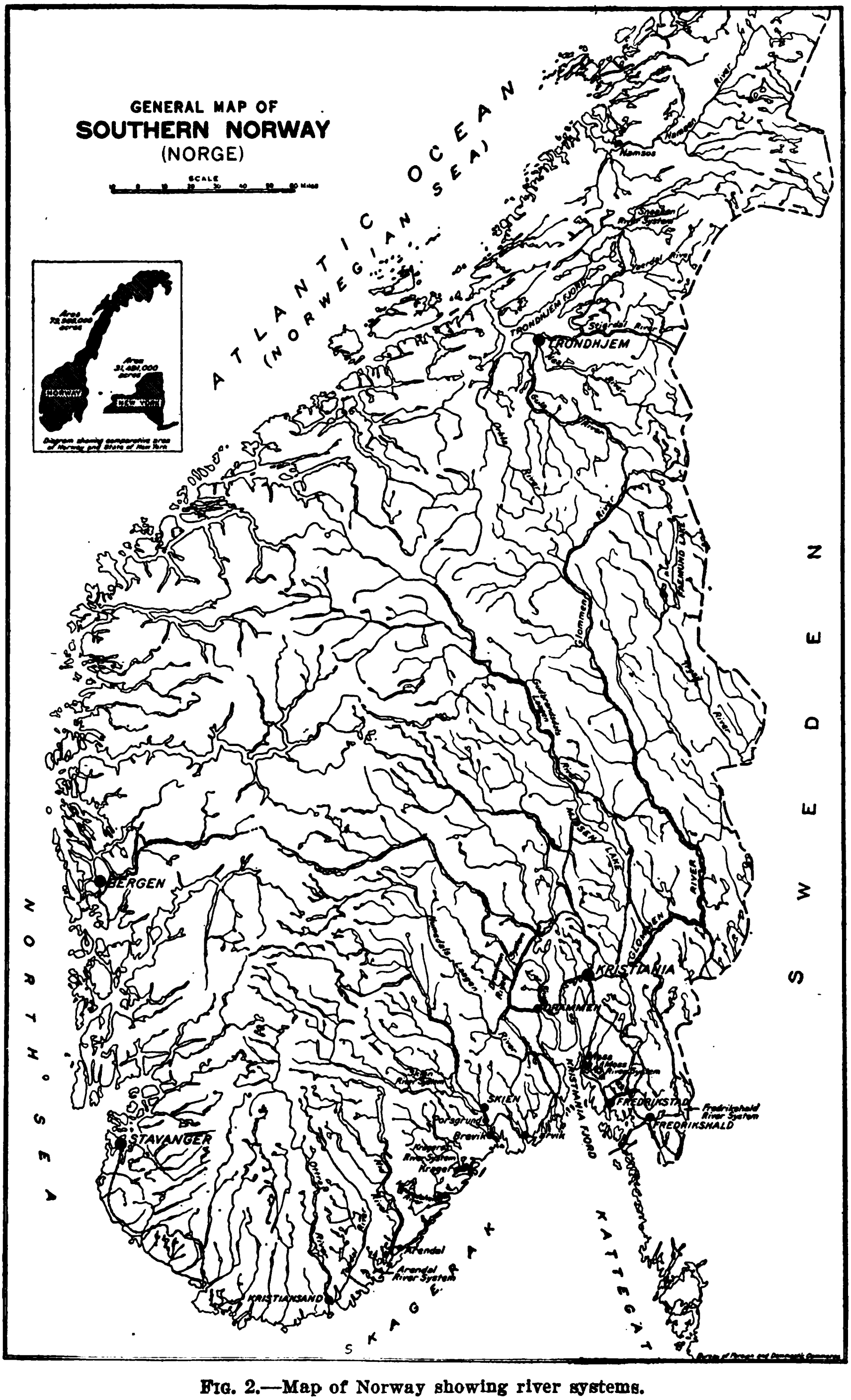

FIG. 2.—Map of Norway showing river systems.

The height of fall in the Norwegian rivers is very considerable on account of their short courses and the high altitude of their sources. Norwegian rivers are therefore generally not navigable.

Norway possesses more water power than any other country in Europe. Estimates of water power available for development vary a great deal and are given from 7,500,000 to 15,000,000 horsepower. Up to 1915 approximately 1,200,000 horsepower had been developed.

A great many of the waterfalls are located in the immediate vicinity of ice-free ports and may easily be utilized. On this account the waterfalls in Norway have played a very important part in the industrial development of the country, but this development has merely been started, and in the future it is expected that it will be carried on to a greater extent.

There are a great many lakes in Norway, and about 4 per cent of the total area consists of inland bodies of water. On account of the mountainous character of the country, the area of these lakes is generally smaller than in the neighboring countries to the east. The largest lake is Mjosen, lying in the central eastern part of Norway. This lake covers about 140 square miles. Faemund Lake, in a northeastwardly direction from Mjosen Lake, is nearly as large.

CLIMATE.

In spite of the great extension of Norway from south to north, the climate does not vary so much in the different parts as might be expected. The country enjoys an excellent climate, notwithstanding its position so far north. While the winters are long, the constant daylight during a large part of the summer accelerates the growth of agricultural products, and even tobacco is grown as far north as 61° north latitude.

The Gulf Stream carries the warm water from the Gulf of Mexico to the Norwegian shores, and the climate of the whole country is thus greatly modified. Except in the interior of the northern and eastern Provinces, where the climate resembles that of northeastern Europe, the winters are mild and all ports are open the year around. In the southern and western coastal districts snow rarely stays on the ground for more than a few weeks. In the interior districts, however, snowfalls prevail during six or seven months of the year.

The mean annual temperature is as follows: Extreme north (interior points, 27° F.; central and eastern Norway (interior points), 33° to 35° F.; western and southern Norway (coast), 45° F.

MERCHANT MARINE.

From the earliest periods of the country's settlement the people of Norway have looked upon the sea as their principal means of income. Norway holds the foremost place among nations in the tonnage of merchant marine in proportion to the population.

Immediately before the war Norway had 2,189 vessels of 100 gross tons or larger, with a total of 2,517,000 gross tons. On July 1, 1919, the merchant marine consisted of 1,645 vessels of 1,894,723 gross tons. It is expected, however, that within a few years the prewar level will be reestablished. Only about 10 per cent of the tonnage was necessary for the country's own needs before the war.

The development of the merchant marine during late years has been toward the establishing of direct steamship lines between Norway and the principal markets of the world, and to-day nearly all the prewar steamship lines have been reestablished and new lines started, so that Norway has steamship connections with practically every country of any importance to its trade.

INTERIOR TRANSPORTATION.

In a mountainous country like Norway it is evident that the efforts to connect the different parts of the country by roads, railways, etc., must meet with many difficulties. Nevertheless, a splendid work has been done in this respect. Excellent highways are found in all parts of the country, but there are comparatively few railways. The total length of the railways is about 2,013 miles, of which 293 miles are privately owned.

With the exception of a few miles from the Swedish border to Narvik in northern Norway, there are no other railways in that part of the country. The lines are mainly in the eastern part, which is the most densely populated.

With a few exceptions, the railways of Norway play a very small part in the lumber export trade, as the rivers afford the best and cheapest means of transportation for the saw logs, and the mills are usually located at ports at the mouths of the floating rivers.

Much of the transportation is carried on by coastwise vessels, as the mountains form almost an insurmountable barrier for land transportation between many districts. The many fiords extending their branches far into the country afford excellent means of communication between the different districts.

The traffic on the lakes is not considerable, and the rivers are generally not navigable. There are only a very few canals in Norway. The only ones of importance are found in the Skien River system in southeastern Norway.

INDUSTRIES.

The principal natural resources of Norway are the land, the forests, the mineral deposits, the water power, and the sea.

The following statement, based on official statistics for 1910, gives the percentage of the whole population of Norway engaged in different activities: Agriculture, cattle raising, and forestry, 41.7 per cent; manufacturing and mining, 26.7 per cent; commerce and transportation on land, 12.6 per cent; fisheries, 5.9 per cent; sea traffic, 4.3 per cent; other activities, 8.8 per cent.

Only about 4½ per cent of the total area of Norway is suitable for cultivation, and about 3½ per cent has been cultivated. This is a smaller percentage of agricultural land than in any of the other European countries. The best cultivated districts are in southern and eastern Norway and in the Trondelagen district. The land is well distributed among a large number of small farms, and there are only few large estates. The value of agricultural products was about $90,000,000 in 1916. The country is generally more suitable for cattle raising than for the cultivation of grain. During normal times considerable quantities of butter and condensed milk were exported. Agriculture and cattle raising are often combined with forest operations, as most of the Norwegian farms are located in the forest sections of the country.

Notwithstanding the mountainous character of the country, the mineral resources are not extensive. The principal products are iron, copper, silver, nickel, and a few others, besides a great many nonmetallic minerals. No coal[1] or oil is found in Norway. The electrochemical industry is growing in importance, following the development of the water power. The total value of the products of the mineral industry was $8,600,000 in 1916.

The canning of meat, fruit, and fish products is a considerable industry and is mainly based on export. The value of the products of the canning industries in 1916 was $13,700,000. The machine and textile industries are chiefly based on the home market. There are also shoe factories, breweries, soap factories, shipbuilding plants, and other industries that are mainly devoted to supplying the needs of the country. The total number of persons engaged in industries was 81,600 in 1905 and 163,000 in 1916.

Along the whole Norwegian coast important fisheries are carried on the year around. The total value of the catch in 1915 was about $23,000,000. In 1910 the value of the products of the seal and whale fisheries was about $5,000,000, but it has largely increased during recent years.

The principal products of the Norwegian industries in export trade are pulp, paper, lumber, ore, metals, chemicals, and canned foods. The total value of these products exported was $143,600,000 in 1916.

COMMERCE.

The following table shows the value[2] of the imports and exports of Norway from 1911 to 1918, inclusive.

Years.	Imports.	Exports.	Years.	Imports.	Exports.
1911	$125,611,600	$79,971,200	1915	$232,624,000	$181,382,400
1912	140,887,600	89,967,600	1916	362,187,600	264,864,400
1913	148,016,400	105,216,800	1917	445,228,400	212,095,200
1914	152,036,400	109,880,000	1918	335,687,000	201,852,800

One receives a wrong impression of the economic conditions in Norway by a comparison of its imports and exports, unless due consideration is given to the income received from the mercantile marine. This income during the war more than made up for the unfavorable trade balance.

During normal times Norway imports chiefly raw materials for its industries, such as metals and minerals, lubricants, petroleum, fertilizers, coal, rubber, cotton, etc., besides foodstuffs, such as grain, sugar, tobacco, coffee, etc. Textiles and machinery are also imported.

The chief commodities exported are fish products, pulp, paper, lumber and lumber products, metals and minerals, ores, fertilizers, and chemical products.

---

[1] Since this report was written Spitzbergen has been awarded to Norway. Extensive coal deposits are found in these islands.

[2] In all cases throughout this report values have been converted from Norwegian to United States currency at the par value of the krone, $0.268.

POPULATION.

The population of Norway was estimated at 2,632,000 on January 1, 1918, or about 20 inhabitants per square mile. More than two-thirds of the population live in the section south of 64° north latitude.

The Norwegians belong to the Scandinavian branch of the Germanic race and are closely related to the Swedes and Danes. Only a small percentage of the population consists of other nationalities. The language is Norwegian, which resembles Swedish and Danish.

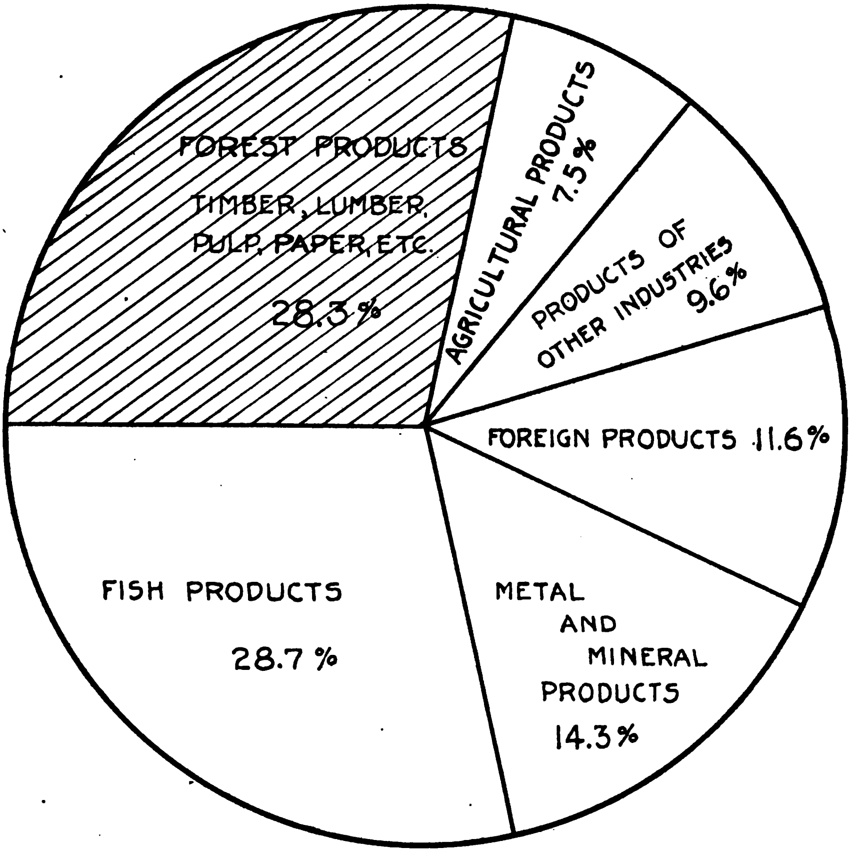

FIG. 3.—Norwegian exports in 1913.

The limited natural resources of the country have forced a considerable number of Norwegians to emigrate, and many have gone to America. It is estimated that about 500,000 Norwegians now live in the United States.

Norway has excellent educational facilities and illiterates are seldom or never seen. School attendance is compulsory, and even in the most remote districts public schools are established by the Government.

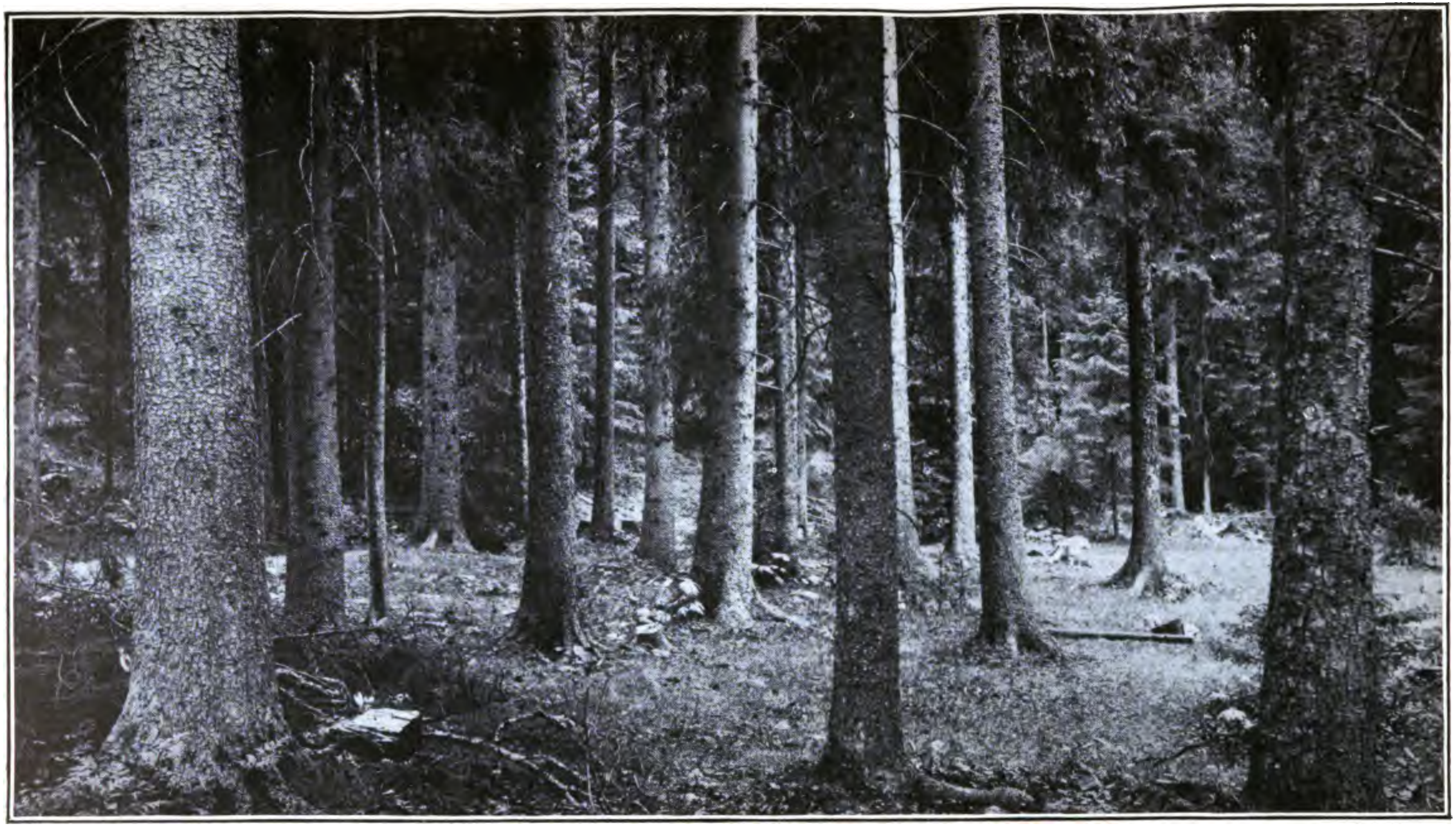

FIG. 4.—EXCEPTIONALLY FINE SPRUCE FOREST.

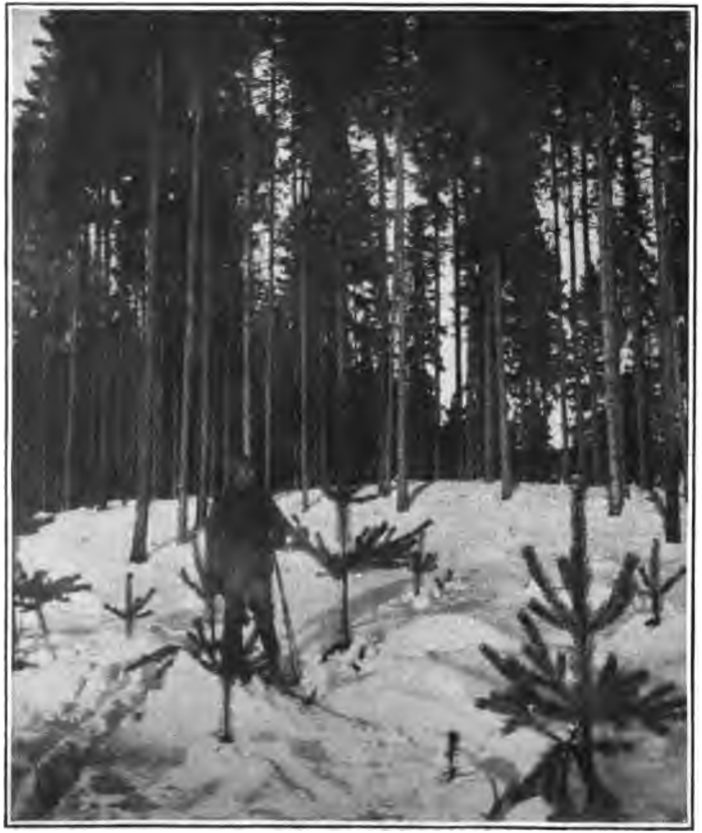

FIG. 5.—EIGHTY-YEAR-OLD SPRUCE STAND IN STATE FOREST.

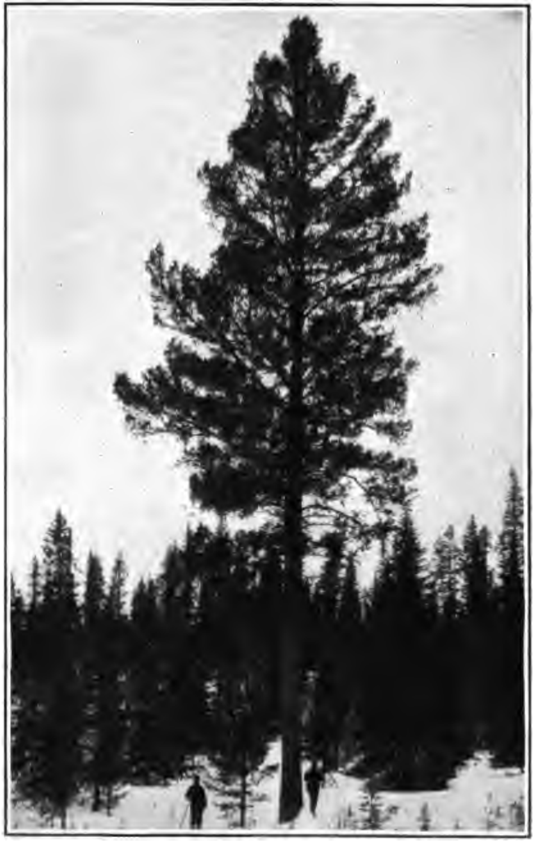

FIG. 6.—EXCELLENT SPECIMEN OF PINE.

PRINCIPAL CITIES.

Christiania is the capital of Norway and has a population of about 260,000. The city is in the southeastern section of Norway, at the head of the Christiania Fiord. It is the principal commercial city in Norway and is of some importance to the lumber export trade. It is a transshipping port for Swedish lumber from the districts immediately east of the Norwegian border.

Bergen, with a population of about 91,000, is on the west coast of Norway, but is of no importance to the lumber export trade.

Trondhjem, with about 54,000 inhabitants, is located on the Trondhjem Fiord. This is a commercial city and is of some importance to the lumber export trade. Considerable quantities of Swedish lumber from the Province of Jämtland in Sweden are exported via Trondhjem.

Stavanger, population about 46,000, is on the southwest coast of Norway, but has no importance to the lumber export trade.

Drammen, with about 26,000 inhabitants, is located near Christiania in the center of one of the most important lumber and pulp districts in Norway.

Among small cities in Norway from which lumber is exported are the following:

Christiansand, on the south coast.

Skien, on the east coast, is the center of an important pulp-producing section. Some lumber is also exported. The city is connected with the interior by a system of sluiced canals.

Fredrikstad is on the west side of the Christiania Fiord and is the most important lumber export port in Norway. In this district pulp and paper are also produced.

Fredrikshald, near Fredrikstad on the Swedish border, is the center of the pulp and lumber production section of that part of the country. Considerable Swedish lumber is exported from both Fredrikstad and Fredrikshald.

Larvik, *Porsgrund*, *Kragero*, and *Arendal* are close together on the east side of the Christiania Fiord and export considerable quantities of lumber. North of Trondhjem there are practically no important lumber shipping points, with the exception of Namsos, as the forest areas in the Provinces of Finmarken, Tromso, and Nordland are so limited that the Government has prohibited the exportation of lumber from that part of the country.

Narvik, in northern Norway, is the shipping port for some Swedish lumber from the northernmost Provinces of Sweden. During the war lumber from Sweden, and even from Finland, was exported via Narvik to the western European countries.

POLITICAL AND ECONOMIC CONDITIONS.

Norway is one of the oldest countries in Europe and has maintained the same form of government for more than 1,000 years. For about 400 years, until 1814, Norway was united with Denmark, and from that time until 1905 it was united with Sweden. The country has not been engaged in war for more than 100 years.

Norway has been free from revolution and disturbances in the past. During late years there has been some labor trouble, as in most of the European countries, but the controversies in Norway have related only to wages and were not of a violent character. Wages before the war were low, but the cost of living was also low. The even distribution of the land is a guaranty for settled political conditions.

The rise in the cost of living for families of moderate income is shown in the following official statement, which gives index figures for April, 1919, based on 100 for July, 1914:

Meat	396	Fuel	318
Pork	341	Clothing	357
Fish food	188	House rent	122
Bread	189	Taxes	352
Flour, meal, etc	280	Other expenses	258
Coffee	163		
Sugar	230	Average	262
Other foodstuffs	276		

Before the war Norway lacked capital for the development of its resources, but the war caused an important change in this respect. The merchant marine was constantly employed during the war and earned large profits for its owners. As the shipping stocks were divided among thousands of holders, the profits were generally well distributed.

There are no reliable estimates of the national wealth of Norway, but it is believed to be about $2,000,000,000 to $2,500,000,000 at the present time. During the war bank deposits increased nearly fivefold.

MONEY, WEIGHTS, AND MEASURES.

The monetary unit is the crown (krone, abbreviated Kr.), which is divided into 100 öre. The standard of value is gold. The par value of the crown is $0.268. The equivalent of 1 dollar is 3.73148 crowns.

The metric system of weights and measures is used in official statistics and often in the domestic lumber trade. In the export lumber trade the English standards of measure are used almost exclusively.

THE FORESTS.

The lack of statistical material in regard to the forests of Norway is striking. There are no reliable statistics concerning the area of the forest lands, and very little information is available in regard to the stands per acre, increment, cutting, etc. As conditions in the Norwegian forest regions are very similar to those in Sweden and Finland, the information given as to the stands, etc., in the reports on Swedish and Finnish forests[1] will supplement the information given in this report on Norwegian forests.

On account of the large area of unproductive land, consisting to a large extent of mountainous areas and land above the timber limit, forests in Norway do not play so important a part in the nation's industries and commerce as, for instance, forests in Sweden and Finland.

The value of the export of forest products aggregated about $24,300,000 in 1913, compared with $115,500,000, the value of all exported commodities during the same period, or 21 per cent of the value of the exports consisted of forest products. The relative importance of forest products in Norway's export trade has decreased during the last half century, the corresponding percentages being 37.3 for the period 1876–1880 and 30 for 1906–1910.

AREA AND LOCATION OF FORESTS.

According to official statistics, the total area of productive and unproductive forests in 1917 was 17,037,566 acres, of which 14,059,734 acres were productive forests and 2,977,832 acres unproductive forest lands. Of the total area of Norway 17.6 per cent is covered by productive forests.

The following table shows the area and location of the forest lands by Provinces:

Provinces.	Area of productive forests.	Area of unproductive forests.	Total area of forest land.	Percentage productive area of total productive forests.	Percentage unproductive area of total unproductive forests.	Percentage productive forests of total area of Province.	Percentage unproductive forests of total area of Province.	Percentage unproductive of total forest area.
	Acres.	*Acres.*	*Acres.*					
Smaalenene	556,985	63,973	620,958	4.0	2.2	53.9	6.2	10.3
Akershus	769,405	58,045	827,450	5.5	1.9	58.2	4.4	7.0
Hedemarken	2,742,688	337,402	3,080,090	19.5	11.3	40.3	4.9	11.0
Christians	1,168,804	190,684	1,359,488	8.3	6.4	18.7	8.1	14.0
Buskerud	1,128,049	94,601	1,222,650	8.0	3.2	30.8	2.6	7.7
Jarlsberg and Larvik	315,913	20,007	335,920	2.2	.7	54.8	3.5	6.0
Bratsberg	1,260,194	141,037	1,401,231	9.0	4.8	33.6	3.8	10.1
Nedenes	701,233	155,116	856,349	5.0	5.2	30.4	6.7	18.1
Lister and Mandal	367,536	91,884	459,420	2.6	3.1	20.5	5.1	20.0
Stavanger	241,566	29,146	270,712	1.7	1.0	10.7	1.3	10.8
Southern Bergenhus	421,629	75,088	496,717	3.0	2.5	10.9	1.9	15.1
Northern Bergenhus	473,746	71,877	545,623	3.4	2.4	10.4	1.6	13.2
Romsdal	527,839	84,474	612,313	3.8	2.8	14.2	2.3	13.8
Southern Trondhjem	960,089	425,581	1,385,670	6.8	14.3	20.8	9.2	30.7
Northern Trondhjem	915,135	365,313	1,280,448	6.5	12.3	16.5	6.6	28.5
Nordland	672,087	199,823	871,910	4.8	6.7	7.1	2.1	22.9
Tromso	390,013	123,006	513,019	2.8	4.1	5.9	1.8	24.0
Finmarken	446,823	450,775	897,598	3.1	15.1	3.8	3.8	50.0
Total or average	14,059,734	2,977,832	17,037,566	100.0	100.0	17.6	3.7	17.5

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[1] Swedish Forests, Lumber Industry, and Lumber Export Trade, Special Agents Series No. 195, and Forest Resources, Lumber Industry, and Lumber Export Trade of Finland, Special Agents Series No. 207. Copies may be purchased from the Superintendent of Documents, Washington, for 75 cents and 80 cents, respectively.

The forest area of Norway was formerly about one-third more extensive than it is at the present time. In the districts on the western coast of Norway large forest areas have been cut out or burned over, and as a consequence practically the whole of western Norway is denuded of merchantable timber. Also in many of the interior districts reckless cutting has been carried on for many years, and there are, practically speaking, no virgin forests left in Norway to-day.

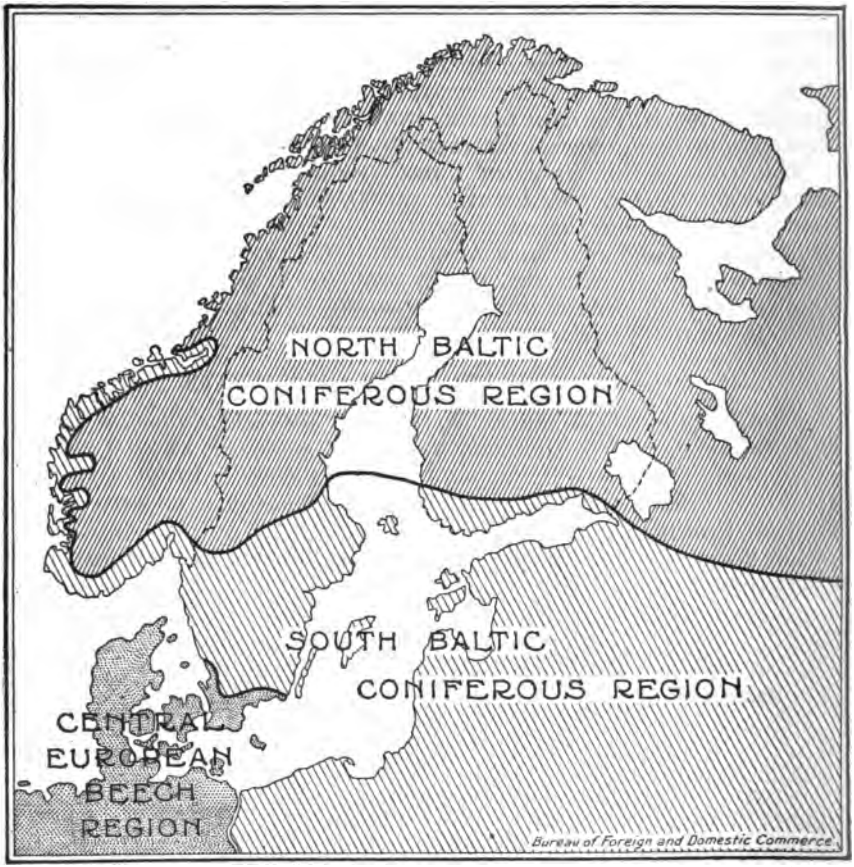

FIG. 7.—Scandinavian forest regions.

The forests of Norway have not generally received such careful attention as have the forests of Sweden, and not until recently have the Norwegian people realized the importance of rational forestry and the necessity of adequate laws to promote it.

A great handicap to the practice of rational forestry in Norway is the fact that the forest area is divided into thousands of small holdings, while only a few large timber areas are in the hands of wood-using industries and large holders. This extensive division of forest lands may in many respects be of great advantage to the nation as a whole, but it has not tended to further rational forest management. The small holders consider forest operations as a branch activity only, and they have not been in a position to maintain expert foresters in their employ. Therefore the Norwegian forests to-day are to a large extent poorly managed and the yield is often only a fraction of what could be obtained under proper management.

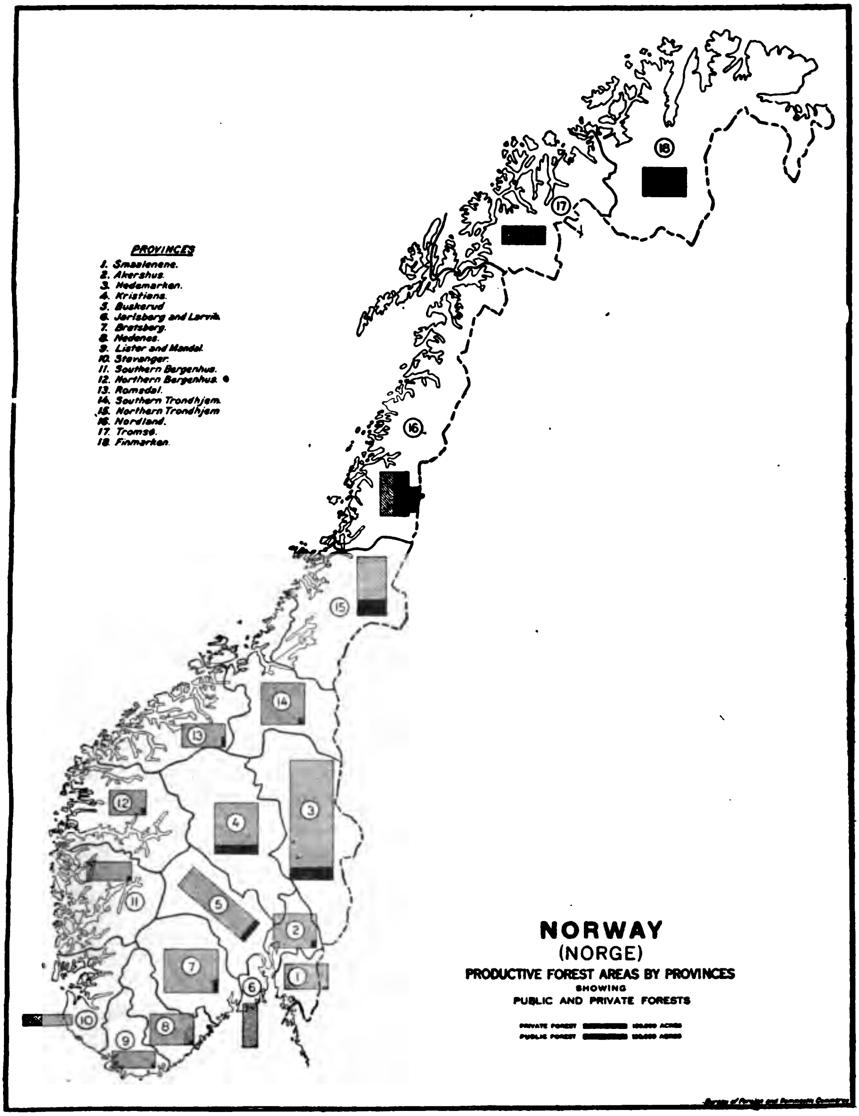

FIG. 8.—Productive forest areas by Provinces.

FOREST REGIONS.

The greater part of the Norwegian forests are located in the North Baltic coniferous forest region, which embraces practically all of the interior districts and the northern districts of the country. The coastal forest regions in the east, southeast, south, and part of western Norway are in the South Baltic coniferous forest region.

Practically all of the Norwegian forests of commercial importance are found south of 66° north latitude. North of this line the forests are unimportant, and as the exportation of lumber from these regions is prohibited on account of the insufficient timber supply for local use, these forests will be given only limited consideration in this report.

NOTES CONCERNING MAP OF PUBLIC AND PRIVATE PRODUCTIVE FORESTS.

The figures upon which this map is based are taken from an estimate of the forest area of Norway compiled by A. N. Kiaer, formerly Director of the Norwegian Government Bureau of Statistics, and contained in the official publication "The History of the Norwegian Forest Service." The area of the public productive forests has been taken from Norwegian Forest Service Statistics, 1916.

The computation of the productive forest area for the whole of Norway and for the public forests has evidently been made on different bases. For instance, in the Province of Finmarken the total area of coniferous and broad-leaf forests (not including unproductive forests and what is given as "public forests above the timber limit) are given as 273,305 hectares by the Norwegian Forest Service, while the total area of productive forests of the whole Province is given as 180,900 hectares by A. N. Kiaer. The area of the public forests in Finmarken Province are given as follows in the Forest Service Statistics: Coniferous forests, 71,405 hectares; broad-leaf forests, 201,900 hectares; unproductive forests, 109,800 hectares; forests above timber limit, 1,814,500 hectares. (One hectare=2.47 acres.)

It is believed that certain classes of forest areas considered as coniferous and broad-leaf forests in the statistics of the Forest Service are classed as unproductive in A. N. Kiaer's tabulation. For this reason the area of productive forests in public ownership is probably given somewhat larger in proportion to the productive area of the whole country. In the Province of Finmarken the area of public productive forest only has been given, as this area is larger than the total area of productive forests of the whole Province according to A. N. Kiaer's statistics, but lacking other information no satisfactory results can be obtained.

SPECIES.

As in Finland and in Sweden, the Norwegian forests consist mainly of coniferous species. The percentage of coniferous and broad-leaf species is not definitely known. It is estimated that 73 to 75 per cent of all forests are coniferous and 25 to 27 per cent are broad-leaf. Although clear stands of both coniferous and broad-leaf forests are found in several parts of Norway, these species usually occur in mixed stands.

The coniferous species are the only ones of interest to the lumber export trade. The small amount of hardwoods produced is used locally and is not sufficient to meet the needs of the country. Considerable quantities of hardwoods are imported annually.

The coniferous forests consist of pine (*Pinus sylvestris*) and spruce (*Picea excelsa*), which are the species found in Sweden and Finland. The broad-leaf forests consist mainly of birch and a few other species of less importance.

The following table gives an estimate of pine, spruce, and broad-leaf stands in various parts of Norway:

Divisions.	Pine.	Spruce.	Broad leaf.
	Per cent.	*Per cent.*	*Per cent.*
Northern Norway	28	14	58
Trondelagen	28	42	30
Western Norway	34	....	66
Southern Norway	44	38	18
Eastern Norway	34	55	11
Average	34	41	25

PINE.

There are two varieties of pine in Norway, *Pinus sylvestris septentrionalis* and *Pinus sylvestris lapponica.* The *lapponica* variety generally grows in the northern parts of the country and in the interior districts, while the *septentrionalis* variety is found mainly in the South Baltic coniferous region. These two varieties, however, are frequently found mixed, and there is no distinct boundary between the districts where they grow. The difference between them is merely a botanical one and has no importance to the lumber trade. (A discussion of these two varieties has been given in the Swedish report.)

Pine is found in nearly all parts of the country up to 70° north latitude. In southern Norway pine grows in an altitude of about 3,100 feet above sea level, but in the northern Provinces it grows only in altitudes less than 650 feet. The maximum height which the pine attains in Norway is from 90 to 100 feet, but it seldom reaches these dimensions. The usual height is from 55 to 65 feet. In the mountainous regions of northern Norway and near the coast the growth is much smaller and at times scrubby.

The taper varies a great deal in different parts of the country. In the best cases it may be about 1¼ inches in 10 feet, but in mountainous regions 1 inch in 6 to 7 feet or less is the average. The growth generally shows 7 to 8 annual rings per inch, but in the mountainous districts and in the northern Provinces the growth is very slow and may show as many as 45 to 50 rings per inch. In the most favorable cases the age of maturity for cutting may be from 75 to 90 years in southern and eastern Norway, while in northern Norway it is generally from 130 to 200 years. The trees are considered suitable for cutting when they measure 9 to 10 inches at breast height.

The quality of Norwegian pine is very similar to that grown in Sweden. On account of the topographical and climatic conditions, the Norwegian pine usually shows a larger percentage of heart than the Swedish pine and is generally more knotty. The best pine stands are found in the districts adjacent to the lower course of the Glommen River near the Swedish border.

SPRUCE.

Several varieties of spruce grow in Norway, but the variety has no bearing upon the quality of the lumber produced.

Spruce came into Norway from the east, and during the last century it has steadily gained ground and has taken the place of pine when the pine stands have been cut out. This development will likely continue, as spruce is a more valuable wood at the present time than pine, being extensively used for the manufacture of pulp. The growth is quick, and forest owners obtain a better return on investments in spruce than in pine forests.

Spruce grows up to 69° 31′ north latitude. In the southern part of the country it grows in an altitude of about 2,800 feet, but this limit gradually decreases northward, and in the northern part it grows only in an altitude less than 600 feet above sea level. North of 66° north latitude spruce is found only in small scattered stands. The best stands are in the districts adjacent to Christiania Fiord and in the Trondelagen district. The maximum height of the spruce tree in Norway is 110 feet, but it seldom attains this height. The age of maturity is approximately 70 to 85 years in the southern and eastern parts of Norway, and 120 to 150 years in the northern Provinces. The trees are cut for saw logs when they attain 9 to 10 inches at breast height.

Of other native coniferous species there is none of any importance in Norway. Extensive plantings of foreign species have been conducted for some time, but there are no commercial stands as yet. Larch, American white pine, Douglas fir, and other foreign coniferous species seem to grow very satisfactorily. Douglas fir grows even as far north as the Arctic Circle.

BROAD-LEAF SPECIES.

The most important of the broad-leaf species is birch (*Betula alba*), of which there are a few varieties. Birch grows all over the country, even up to 70° 40′ north latitude. In the southern part of the country birch grows in altitudes up to 4,900 feet and in the northern part up to 1,000 feet above sea level. In the higher altitudes the growth is scrubby. The best stands of birch are found in eastern Norway. Alder (*Alnus incana*) is also found in considerable quantities, scattered all over the southern Provinces.

Other broad-leaf species of less importance are beech (*Fagus silvatica*), oak (*Quercus robur*), aspen (*Populus tremula*), ash (*Fraxinus excelsior*), maple (*Acer platanoides*), elm (*Ulmus montana*), basswood (*Tilia parvifolia*). These broad-leaf species are found in small quantities and scattered stands but are usually mixed with coniferous species. They are of no importance in the lumber export trade.

STANDS PER ACRE AND ANNUAL INCREMENT.

The statistical material available in regard to stands and annual increment is very limited. Although various estimates have been given from time to time covering part of the Norwegian forests areas, no official investigation to ascertain the total quantity of standing timber in Norway has ever been made. The lack of this information has been a serious drawback in determining a policy of forest management, laws regarding cutting, etc. It is certain that the forests generally have been recklessly cut in the last 50 years, but in what proportion to the annual increment is a matter of uncertainty. A study of the forest resources has recently been started by the Norwegian Government.

The conditions of the forests vary a great deal in the different parts of Norway, and more so than in the other northern European countries, on account of the difference in topographical conditions and the soil in the northern and southern sections of Norway.

SURVEYS BY NORWEGIAN HYPOTHECARY BANK.

Among the best and most reliable estimates regarding the stands per acre and the annual increment of some of the Norwegian forests are those made by the Norwegian Hypothecary Bank. The figures were published in 1908 and cover investigations made during a period of 10 years. It should be noted that these estimates have not taken into consideration trees holding less than 4-inch diameter at breast height and include only stands of pine and spruce. Broad-leaf trees are not included.

In the bank's estimates, a tabulated summary of which is given below, the trees are divided into two categories. The first category includes trees large enough to produce saw logs and the second category those which within a short period of time (10 to 15 years) will produce timber suitable for saw logs. Measurements were made at breast height and inside the bark.

Forest districts.	Stand in cubic feet per acre of productive forest land.			Annual increment in cubic feet per acre of productive forest land.		
	Trees 8 inches in diameter.	Trees 4 to 8 inches.	Total.	Trees 8 inches in diameter.	Trees 4 to 8 inches.	Total.
Glommen district	363	556	919	11.4	18.6	30.0
Drammen district	702	639	1,341	24.3	22.9	47.2
Skien district	247	385	632	10.0	17.2	27.2
Northern Trondhjem: Namdalen	250	293	543	7.2	8.6	15.7
Inderoen district	309	302	611	10.0	10.0	20.0

Although these results may not be considered as absolutely conclusive for the districts mentioned, the forest area cruised in each district is so large that this estimate carries great weight in reaching a definite conclusion in regard to the stands and the annual increment of the whole country. The forests cruised in the Drammen forest district were those in the lower course of the Drammen River and may not be representative of the whole forest district tributary to this river.

Several years ago an area of about 220,000 acres of productive forest in eastern Norway was cruised. The results showed an average stand of 586 cubic feet per acre of productive forest and an annual increment of 12.3 cubic feet. Other timber holdings in eastern Norway belonging to the Kongsberg silver mines (State owned) showed an average stand of 745 cubic feet per acre and an annual increment of 11 cubic feet per acre. Another forest in the same district showed a stand of 480 cubic feet per acre and an annual increment of 11.4 cubic feet.

Better conditions as to stands and annual increment in eastern Norway are found in the districts north and northeast of the Christiania Fiord. These forests have usually been well managed, and some of them show stands of 1,000 to 2,500 cubic feet per acre of productive forest lands and an annual increment of 28 to 50 cubic feet per acre.

The Norwegian Hypothecary Bank has estimated the average stand in certain parts of southeastern Norway at 832 to 1,341 cubic feet per acre of productive forest and the annual increment from 27.1 to 47.2 cubic feet per acre. In the Province of Trondelagen the results of investigations made in forests in the Selbu district show an average stand per acre of 895 cubic feet and an annual increment of 13.4 cubic feet per acre. Other forests in near-by districts show an average stand of 846 cubic feet per acre and an annual increment of 7 cubic feet per acre, productive forests.

The State forests in the northern part of the Province of Northern Trondhjem show an average stand of 638 cubic feet per acre and an average annual increment of 10.9 cubic feet per acre. Better stands in these districts show from 1,500 to 1,900 cubic feet and average annual increment from 32 to 40 cubic feet per acre. The Norwegian Hypothecary Bank has found the average stand per acre in some of the northern sections of the Province of Northern Trondhjem as 543 cubic feet per acre and in the eastern interior parts of Trondelagen as 611. The average annual increment was 15.7 cubic feet and 20 cubic feet per acre, respectively.

In the western coastal districts the forests show less favorable results and are of small importance.

Very few private forests in northern Norway have been cruised, and the results obtained are not of sufficient value to be used as a basis of a calculation covering the whole territory. In this section the stands are thin and the growth exceedingly slow. The annual increment may be estimated at about 7 to 14 cubic feet per acre and the stand 600 to 800 cubic feet per acre.

The stands in southern and western Norway do not come up to those in eastern Norway in regard to density, as the country is very mountainous and hilly. Some of the forests that have been well managed for a number of years show from 250 to 1,000 cubic feet per acre.

It may be estimated that the average stand per acre of productive forest land in the entire county is between 472 and 972 cubic feet. Well-managed forests may show stands several times greater than the average, thus demonstrating what could be accomplished if the forests in general were better managed. Forester Agnar Barth has given the average stand per acre of productive forest land at 787 to 858 cubic feet, which no doubt is a conservative estimate.

A rough estimate gives the total quantity of standing timber at 10,000,000,000 to 12,000,000,000 cubic feet, but these figures are of doubtful value.

OTHER ESTIMATES OF ANNUAL INCREMENT.

One of the first estimates of the annual increment covering the whole country was published by the Forest Commission in 1874. This estimate was as follows: Forests south of 65°, 22.9 cubic feet per acre of productive forests; forests north of 65°, 7.3 cubic feet per acre.

A second estimate was made by Prof. Helland in 1896 with the following results: Eastern and southeastern Norway, 22.9 cubic feet per acre of productive forests; western Norway and Province of Southern Trondhjem, 18.2 cubic feet; Province of Northern Trondhjem, 11.4 cubic feet; average of above districts, 20.8 cubic feet; northern Norway, 7.3 cubic feet.

The most recent estimate was given a short time ago by Forester Agnar Barth: Eastern, southern, and western Norway, 28.6 cubic feet per acre of productive forests; Trondelagen, 24.3 cubic feet; northern Norway, 14.3 cubic feet; average for whole country, 26.3 cubic feet. This estimate is generally considered the most reliable.

FIG. 9.—SPRUCE FOREST IN WINTERTIME.

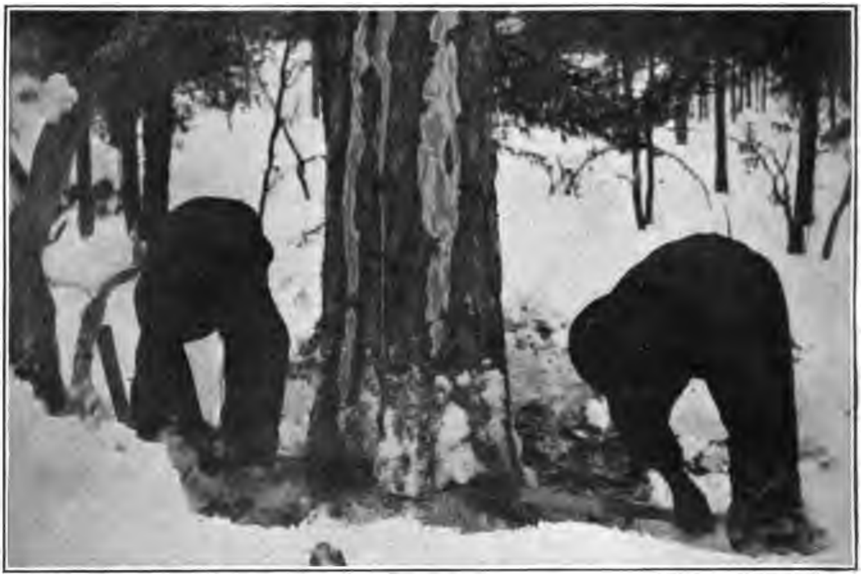

FIG. 10.—FELLING OF TIMBER.

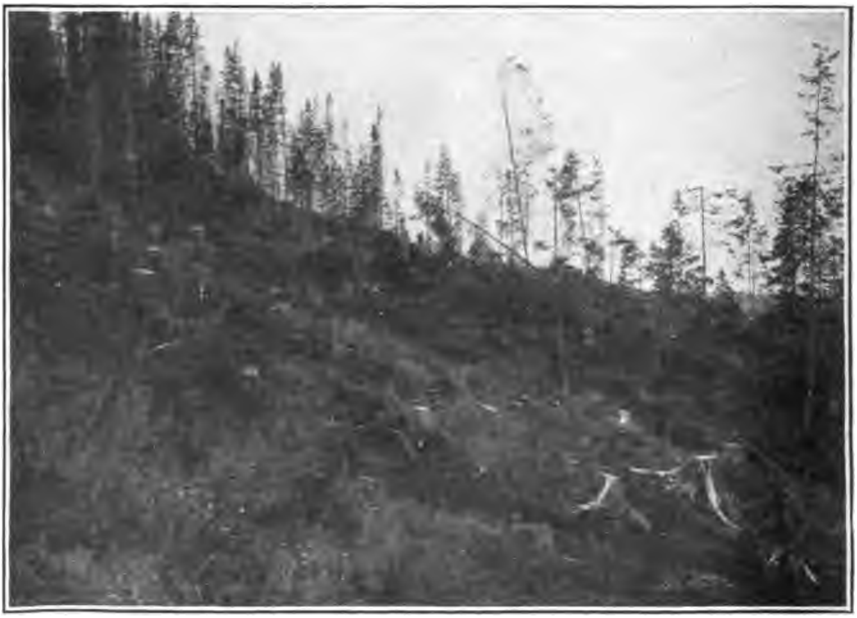

FIG. 11.—PRIVATE FOREST CUT IN ACCORDANCE WITH LOCAL REGULATIONS.

ANNUAL CUT IN NORWEGIAN FORESTS.

Calculations based on prewar trade statistics for 1908 to 1912, inclusive, indicate an average annual cut of timber for export as follows:

	Cubic feet.
Rough and planed lumber	43,300,000
Round and hewn timber	8,100,000
Mechanical wood pulp	26,300,000
Cellulose	31,700,000
Paper and cardboard	23,700,000
Joinery and cooperage	300,000
Total raw material for export	133,400,000
Less imported raw material	[a]12,400,000
Cut for export in Norwegian forests	121,000,000

The domestic consumption of wood has not recently been investigated, but is estimated at about 124 cubic feet per capita. The prewar annual domestic consumption of wood has been given as about 298,600,000 cubic feet.

The quantity of top logs, rotten logs, and other defective material annually left in the forests is estimated at about 22,100,000 cubic feet.

A recapitulation of the above figures gives the following results:

	Cubic feet.
Cut for export	121,000,000
Domestic consumption	298,600,000
Waste in forests	22,100,000
Total cut	441,700,000
Annual increment (estimate by Barth)	342,616,000
Annual cut in excess of increment	99,084,000

There is reason to believe that this is a conservative estimate, although most of the lumbermen in Norway have expressed their opinion that the excess cutting shown in this statement is exaggerated. It is claimed by the lumbermen that up to the present overmature forests have been cut and that this gives better growing conditions to the young stands. The young forests grow more rapidly and give the forest owners a larger yield per acre when overmature stands showing a very small percentage of annual increment are cut out.

It is also contended that Forester Barth has not given due consideration to the stands of young forests in calculating the annual increment, as only trees holding more than 4 inches at breast height have been taken into account. Furthermore, it is contended that nowadays the forest management is much better than formerly, and great progress is noted everywhere in planting and reforestation.

There is no doubt a great deal of truth in the statements made by both parties. However, it is certain that an excess cutting has taken place in the Norwegian forests during many years, but nobody seems to be able to determine exactly to what extent.

During the war the excess cutting was materially increased as a result of the high prices paid for timber, lumber, pulp, and paper. Not only were mature stands cut, but also young trees and saplings. Pit props and mining timber have been cut all over the country in large quantities. This may easily be understood when considering the fact that the export f. o. b. prices for props went up from about $0.25 per cubic foot before the war to about $1.10 per cubic foot during the war.

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[a] See footnote on p. 55.

The domestic consumption of firewood increased very materially as a result of the coal shortage and the excessive prices paid for this commodity. During the war as much as $68 per ton was paid for coal against $4 to $5 before the war. There are no figures available showing how much timber was cut during the war, and most of the Norwegian forests show evidences of having been severely taxed. During 1918 the Norwegian Government alone cut about 26,000,000 cubic feet of wood to fulfill the Government's requirements for fuel. Many of the railroads and steamships used wood for fuel during the war.

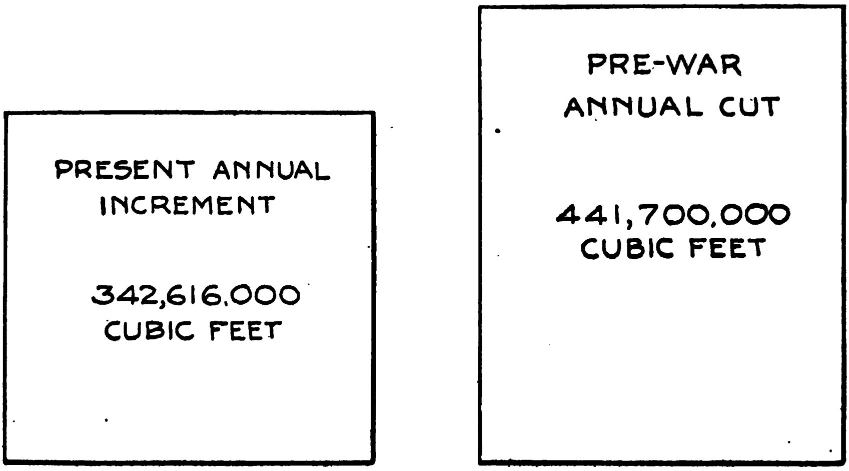

FIG. 12.—Relation between annual increment and annual cut in Norwegian forests.

RELATION BETWEEN ANNUAL INCREMENT AND ANNUAL CUT.

Ever since the conditions of the Norwegian forests have been given consideration, experts have said that the forests of Norway have been cut in excess of the annual growth. The rapid development of the wood-using industries during the last half century, and particularly during the war, stimulated cutting to a greater extent than before. It should be noted, however, that the accessible timber area of Norway has been increased during the last few decades as the floating rivers have been improved, making it possible to exploit remote forest districts. This has to some extent relieved the situation.

There is another point that is of some importance in this connection. In the early stage of the lumber industry only heavy timber was considered suitable for sawing, and the apprehension of the authorities in regard to the cutting out of the forests of the country may easily be understood. During the last few decades the lumber mills have beeen forced to utilize timber of smaller dimension, but the percentage of lumber obtained from the raw material is much larger than formerly on account of the better equipment of the mills for closer utilization.

Since it is impossible to obtain a reliable estimate of the annual cut and the annual increment in Norway, no one can tell to what extent the Norwegian forests have been cut in excess of the annual growth. The views expressed on this subject vary considerably. A noted expert in Norway, Forester Agnar Barth, has probably done more than any other individual in that country to check reckless cutting. He recently published a treatise on the subject of annual growth and annual cut, based on conditions before the war, which has probably received more attention than any other article written on the Norwegian forests.

Forester Barth makes two estimates in regard to the annual increment.

Estimate No. 1.—The annual increment of all Norwegian forests may be on an average about 2.8 per cent. Considering the total stands in the forests as 11,162,000,000 cubic feet, the total annual increment would thus be about 312,500,000 cubic feet.

Estimate No. 2.—In order to check the foregoing statement the total annual increment was calculated for each district of the country separately, as follows:

Districts.	Productive forest area.	Annual increment per acre.	Total annual increment.
	Acres.	*Cubic feet.*	*Cubic feet.*
Eastern, western, and southern Norway	9,510,241	28 to 28.6	272,106,000
Trondelagen	2,033,798	24 to 24.3	49,443,000
Northern Norway	1,472,614	14 to 14.3	21,067,000
Total	13,016,653	26 to 26.3	342,616,000

The difference between these two estimates is 30,116,000 cubic feet. In the second estimate the area of productive forest land has been made less than that given in the official statistics, as the latter were compiled more than 10 years ago, and it was considered that the area of productive forest land had decreased since that time.

The purpose of Forester Barth's estimates was evidently to call public attention to the danger facing the future of the nation's forests, and it is certain that he succeeded in this respect.

Drastic measures must, in the opinion of both the Government and forest experts, be taken to remedy these conditions. Both the domestic consumption of wood and the export of forest products will likely have to be reduced unless increased quantities of raw material can be obtained from other countries, as was the case during the last few years before the war.

FOREST OWNERSHIP.

According to the latest estimates, made in 1907, the ownership of the Norwegian forests was divided as follows:

Classification by ownership.	Acres.	Per cent.
Private forests	7,371,000	52
Sawmills, pulp and paper mills, other industrial establishments, and larger holders	3,664,600	25
Public forests	2,107,800	15
County and commune forests	763,300	6
Mines and charitable institutions	156,900	1
Total	14,065,600	100

About 50 or 60 years ago, before the start of the lumber industry on a large scale, the forest area was divided as follows: Private forests, 84 per cent; county and commune forests, 3 per cent; mines and charitable institutions, 1 per cent; State forests, 12 per cent.

FOREIGN OWNERSHIP.

During the last decade there has been a strong movement in Norway to restrict the investment of foreign capital, and a series of laws have been passed to this effect. These laws not only limit investment of foreign capital, but also restrict the selling of forest land to persons not residing in the particular district where the forests are situated. Prior to 1909, when these laws were passed, considerable areas of forest had been purchased by foreigners, especially by British interests. During the war, however, most of these foreign-owned forests were acquired by Norwegian interests. Recently the largest pulp and paper mill in Scandinavia, with large holdings of timberlands, was sold by the British owners to a Norwegian syndicate for about $34,000,000.

At the present time the area of foreign-owned forests in Norway is small. Some Swedish sawmills still hold timberlands adjacent to the waterways running into Sweden, but these forests could hardly be profitably exploited by the Norwegian mills. On the other hand, the Norwegian-owned forests in Sweden have a higher value than the Swedish properties in Norway. The forests of Norway must, therefore, be considered as almost entirely Norwegian owned.

PRIVATE FORESTS.

In no other European country are the forests divided among so many small holders as in Norway. There are only a few large estates. The land is in the hands of thousands of small holders and the system of leasing to tenants is almost unknown. The Norwegian laws have also protected the farmers, so that if a farm has been sold the descendants of the original owner may force the new owner to cede the property to them at a price fixed by the authorities in each case.

It is necessary for most of the farmers in Norway to possess some forest land in order to secure fuel, building material, etc. The wood lots are also an important support to the Norwegian peasants during years when the crops fail. Moreover, the forest operations afford a profitable occupation for the farmer during the winter. The majority of private forest holdings in Norway consist of small wood lots scattered all over the country.

Since the middle of the last century a great many farm wood lots have been sold to sawmills, pulp and paper factories, etc., but still the farmers usually possess more timberland than necessary for their own requirements. Large quantities of logs are annually sold by the peasants to sawmills, pulp mills, and other wood-using industries.

The position of the Norwegian farmers is thus considerably stronger than that of the farmers in many other countries where the farm wood lots have been separated and sold to wood-using industries. The measures taken by the Norwegian Government to restrict the separation of forest land from farming properties is largely responsible for this condition.

There are, however, several drawbacks in connection with the distribution of forest land among many small holders. It is evident that a peasant holding a few hundred acres of forest land can not give the same proper attention to its management as can larger holders. With the peasant the forest operation is a branch activity. Only in very rare cases do the peasants secure expert assistance to manage their forests. The difference in the conditions of the generally well-managed forests belonging to industrial establishments and the Norwegian farm wood lot are very striking. During late years, however, as a consequence of the increased value of stumpage and forest products, the peasants have to a greater extent than previously realized the importance of a rational management of their forests.

The Norwegian forest laws have not until recently contained regulations regarding the cutting, except in a few special cases. It has been left to the forest owners to cut as they liked, and this fact has caused considerable destructive cutting in all parts of Norway. Also there has been a certain class of speculators who have bought wood lots or both farm and wood lots and have clear cut the stands. In this way large areas of the Norwegian forests have been cut over. Recently the Government has made energetic efforts to stop this practice.

A law provides that no sale of farm wood lots can take place whereby the farm would be deprived of the forest necessary to provide the farm with timber for construction material, fuel, etc.

Other laws stipulate that the sale of timber holdings is subject to special concession by the Government, unless the purchaser is a relative of the seller. As a rule, the county where the property is located has the first option to purchase the property. Small forest areas may be acquired without concession. The law stipulates the maximum area which may be purchased by any one person without concession. There are also special provisions regarding the maximum forest area which any one person or company may hold in each district or county, and additional purchases are subject to concession.

FORESTS BELONGING TO WOOD-USING INDUSTRIES AND LARGE HOLDERS.

Contrary to the conditions in Sweden and Finland, only very few Norwegian sawmills possess sufficiently large timber holdings to supply their requirements for raw material. The largest part of the forest area held by wood-using industries belongs to pulp mills.

In prewar days, when the stumpage values were comparatively low and the unsatisfactory financial condition of the farmers in general often forced them to rely on their forests as a source of revenue, the advantage to the wood-using industries in possessing extensive timber holdings was not so apparent. During the war conditions changed and the mills depending upon purchased logs have had many difficulties. Since 1909 the concession laws have prevented the sawmills from purchasing forest lands in districts other than in those where the mills are located.

Private enterprise always seeks the best investment, and the forests belonging to the wood-using industries are decidedly the best in

Norway, both in regard to location and quality of the timber. Most of these forests are coniferous, and 35 per cent of the total stands of coniferous forests in Norway belongs in this category of ownership. Trained foresters are often employed and the forests are generally well managed. There are also several individual holders of extensive forests who have managed their properties in a rational way for generations.

FORESTS BELONGING TO COUNTIES AND COMMUNES.

A great many counties and communes own extensive forest land which is devoted to the mutual benefit of the residents in these districts. In many instances these forests have been in their possession for centuries. The value of these forests in 1915 was about $15,000,000.

During late years the area of forest land belonging to this group has been materially increased by purchase, as in many districts the counties and communes have availed themselves of the first option to purchase timberland when a property has been offered for sale to persons or corporations residing in other districts.

In some instances the forests have been managed by trained foresters, but as a rule this has not been the case until recently, when it was made compulsory by law.

FORESTS IN OTHER OWNERSHIP.

For centuries several of the oldest mining companies have held large areas of forest lands to supply the charcoal which formerly was used in smelting the ore. These forests are now of less importance to these mines, since other methods of smelting are used.

A few charitable institutions in Norway possess limited areas of forests. These forests are mostly in Trondelagen.

NORWEGIAN OWNERSHIP OF FOREIGN FORESTS.

The forest resources of Norway have for some time been too small to allow the Norwegian lumbermen and woodworking establishments to expand, and even before the war Norwegian capital was invested to quite an extent in Finland and Russia, where the Norwegian lumbermen operated planing mills and sawmills. During the war these foreign investments grew very materially and several important purchases of forests were made, especially in Russia, but also in Austria, Canada, South America, Africa, and other countries.

It would, no doubt, be of great importance to the lumber industry in Norway if the wood-using industries could acquire additional forest land in order to safeguard the future supply of raw material. This would not only stabilize the industry but also promote closer utilization of the waste products and further better forest management.

PUBLIC FORESTS.

The public forests consist of State-owned forests and of forests controlled and managed by the State but owned by official institutions and organizations. Formerly the Government owned large areas of timberland, but much of it has been sold to private interests and to counties and communes in various parts of the country.

It was not until about 60 years ago that the Government realized the importance of possessing forests, and since 1860 considerable areas of forest lands have been added to the public forests through purchase.

The area of the productive forests in public ownership is, according to the statistics of 1916, 2,248,138 acres, or 16 per cent of the total productive forest area of Norway. The forest area in public ownership is therefore comparatively small. Of the public productive forests the State owns 2,085,330 acres, while 162,808 acres are embraced in other public forests.

The location and extent of these forests are shown in the following table:

Provinces.	State forests.				
	Coniferous.	Broad-leaf.	Total productive.	Unproductive.	Total.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Finmarken	176,370	498,693	675,063	271,206	946,269
Tromso	57,674	99,104	156,778	12,286	169,064
Nordland	106,741	215,539	322,280	158,779	481,059
Northern Trondhjem	193,433	36,445	229,878	298,439	528,317
Southern Trondhjem	65,886	51,124	117,010	49,144	166,154
Romsdal	15,232	3,045	18,277	2,855	21,132
Northern Bergenhus	9,852	6,900	16,752	3,598	20,350
Southern Bergenhus	6,882	454	7,336	1,314	8,650
Stavanger	9,416	902	10,318	1,006	11,324
Lister and Mandal	1,397	52	1,449	189	1,638
Bratsberg	22,658	....	22,658	714	23,372
Jarlsberg and Larvik	....	69	69	....	69
Buskerud	41,472	....	41,472	9,604	51,076
Christians	79,345	117,564	196,909	48,565	245,474
Hedemarken	232,755	28,578	261,333	146,763	408,096
Akershus	7,452	296	7,748	1,974	9,722
Total	1,026,565	1,058,765	2,085,330	1,006,436	3,091,766

Provinces.	Other public forests.				
	Coniferous.	Broad-leaf.	Total productive.	Unproductive.	Total.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Tromso	1,272	14,773	16,045	1,933	17,978
Nordland	4,234	8,730	12,964	4,883	17,847
Northern Trondhjem	7,694	788	8,482	2,864	11,346
Southern Trondhjem	8,801	1,188	9,989	2,369	12,358
Romsdal	6,947	1,167	8,114	1,364	9,478
Northern Bergenhus	1,611	1,087	2,698	461	3,159
Southern Bergenhus	3,456	1,287	4,743	1,567	6,310
Stavanger	1,346	349	1,695	201	1,896
Lister and Mandal	5,041	760	5,801	1,317	7,118
Nedenes	6,020	477	6,497	1,984	8,481
Bratsberg	10,287	20	10,307	328	10,635
Jarlsberg and Larvik	2,462	261	2,723	61	2,784
Buskerud	15,708	659	16,367	2,159	18,526
Christians	13,821	4,211	18,032	1,334	19,366
Hedemarken	21,324	3,129	24,453	2,757	27,210
Akershus	9,855	139	9,994	1,160	11,154
Smaalenene	3,850	54	3,904	296	4,200
Total	123,729	39,079	162,808	27,038	189,846

Provinces.	Total public forests.				
	Coniferous.	Broad-leaf.	Total productive.	Unproductive.	Total.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Finmarken	176,370	498,693	675,063	271,206	946,269
Tromso	58,946	113,877	172,823	14,219	187,042
Nordland	110,975	224,269	335,244	163,662	498,906
Northern Trondhjem	201,127	37,233	238,360	301,303	539,663
Southern Trondhjem	74,687	52,312	126,999	51,513	178,512
Romsdal	22,179	4,212	26,391	4,219	30,610
Northern Bergenhus	11,463	7,987	19,450	4,059	23,509
Southern Bergenhus	10,338	1,741	12,079	2,880	14,959
Stavanger	10,762	1,251	12,013	1,207	13,220
Lister and Mandal	6,438	812	7,250	1,506	8,756
Nedenes	6,020	477	6,497	1,984	8,481
Bratsberg	32,945	20	32,965	1,043	34,008
Jarlsberg and Larvik	2,462	330	2,792	61	2,853
Buskerud	57,180	659	57,839	11,763	69,602
Christians	93,166	121,775	214,941	49,899	264,840
Hedemarken	254,079	31,707	285,786	149,520	435,306
Akershus	17,307	435	17,742	3,134	20,876
Smaalenene	3,850	54	3,904	296	4,200
Total	1,150,294	1,097,844	2,248,138	1,033,474	3,281,612

As in Finland and Sweden, the greater part of the public forests in Norway are in the northernmost sections of the country. About 50 per cent of the public area is north of the Arctic Circle. There are, however, very valuable forest areas in public ownership in the Provinces of Hedemarken, Christians, and Buskerud and in other sections of eastern and southeastern Norway. The large percentage of broad-leaf species in the public forests is striking, particularly in northern Norway, where only a small percentage of the public forests consists of coniferous stands.

The unproductive forest area below the timber limit consists of swamps, bogs, mountains, etc., part of which is unsuitable for reforestation. Large areas of land above the timber limit are also in public ownership, but no consideration will be given to these sections, as they are unsuitable for the growing of forests.

The value of the public forests in Norway was given as follows in 1916: State-owned forests, $11,386,000; other public forests, $4,513,000; total, $15,899,000. The value of most of these forests is materially decreased by rights which have been given to landowners in the forest districts to cut wood for fuel, building material, etc., and rights to pasture cattle, and these rights will for all time be maintained. The net value of the public forests is, therefore, somewhat smaller, or about as follows: State-owned forests, $9,573,000; other public forests, $4,027,000; total, $13,600,000.

The purchase of additional forest land by the State has not been effected on a large scale until recently. The State has mainly acquired lands situated near the timber limits, cut-over areas, and land near the coast; in short, areas which in most cases only the State could afford to operate as forest lands, because they will not likely give any immediate financial return. The State has also undertaken to purchase and reforest large areas that would afford protection against the elements, sandstorms, etc.

Since 1860 about 548,000 acres of forest land have been acquired by the Government and incorporated in the public domain. In 1917 forest land at a value of $31,000 was purchased by the State; in 1916 the purchases aggregated $437,000, and in 1913, $12,000.

The importance of the public forests to the sawmill industry is comparatively small, as only very small areas of forests are so situated that the mills can obtain saw logs from them.

ADMINISTRATION.

The public forests are managed by the Norwegian Forest Service, which is a branch of the Department of Agriculture.

The Forest Service is headed by a director, assisted by a forest counselor, a legal counselor, nine secretaries, and three assistants. The country is divided into three forest districts, each headed by a chief forester. These districts are subdivided into minor districts, of which there are 38 for the whole country. There is also a special branch of the Forest Service engaged in cruising the public forests.

The Forest Service has charge of the public forests and other public lands, institutions and schools of forestry, supervision of the laws affecting the management of the private forests, laws and regulations regarding prevention of forest fires, supervision of floating associations, etc.

It also maintains several nurseries and has reforested considerable areas of unproductive forest land. In 1917 $14,000 was spent for these purposes, and in 1913 $24,000. Considerable improvement of the floating rivers is also made by the Forest Service.

ANNUAL CUT.

The cut of timber in the public forests in 1917 and the revenue therefrom are shown in the following table:

Classification.	Cubic feet.	Net revenue.
Sold standing:		
Timber for saw logs (439,859 trees)	4,756,851	$450,000
Small-dimension timber (80,579 trees)	270,539	31,000
Firewood	764,810	10,000
Sold cut:		
Saw logs (406,651 logs)	3,610,308	422,000
Small-dimension logs	97,534	6,000
Firewood	1,719,851	23,000
Various	26,828	1,000
Total (not including cut by peasants and landowners under special rights)	11,246,721	943,000

In 1913 the total cut was 7,227,428 cubic feet, and the net revenue $389,000.

The State operates a few sawmills, but they are small and produce only for local markets. The Forest Service will not likely expand these activities, as the State can usually sell its timber at good prices.

RECEIPTS FROM THE OPERATION OF PUBLIC FORESTS.

The net profit from the operation of the public forests from 1857 to 1919 is given in the following statement:

1857–1874, average	$18,000	1911	$341,000
1875–1880, average	33,000	1912	359,000
1880–1885, average	46,000	1913	375,000
1885–1890, average	35,000	1914	402,000
1890–1895, average	34,000	1915	382,000
1895–1900, average	62,000	1916	423,000
1901–1905, average	172,000	1917	548,000
1906–1910, average	339,000	1918 (estimated)	1,037,000

COLLEGE AND SCHOOLS OF FORESTRY.

The State College of Agriculture at Aas, near Christiania, established in 1897, maintains a branch devoted to forestry and scientific research work in this line.

The college has two courses of one and two years, respectively. One year of practical experience in the woods, besides a high-school education or a completed course at a school of forestry, is required to enter the college. The subjects are forest management, cruising, botany, logging, geology, and other related subjects. The tuition is practically free.

In connection with this college a forest laboratory was established in 1917. Private experimental stations and laboratories receiving official support have been maintained for some time in eastern Norway and on the west coast.

There are four State-operated schools of forestry in various parts of the country and five schools partly supported by the State but mainly operated by the Provinces where they are located. As a result of the growing interest throughout the country in rational forest management, these schools are now attended by a large number of students.

NORWEGIAN FOREST ASSOCIATION.

Probably no other institution in Norway has done more to further a rational management of the forests in the country than the Norwegian Forest Association, which was established about 20 years ago by private enterprise to spread knowledge of rational forest management and forest culture. Until recently the association received direct financial support from the Government. Now it has important funds of its own, and no direct Government support is given.

Through the association swamps have been drained and unproductive land has been reforested. The association also gives free assistance to forest owners in regard to the management of their forests. Its head office is at Christiania, but it maintains a number of local associations in the different Provinces, at the head of which are trained foresters. Through these foresters a great deal of information is spread, and the forest owners may obtain free of charge the service of the local foresters in selecting trees for cutting.

The association also operates nurseries and distributes seeds at a very low cost. Large areas, especially in western Norway, have been reforested through the efforts of this association. During 20 years of its existence, from 1898 to 1918, 139,579,020 trees were planted and 12,064 pounds of seeds distributed to all parts of the country, whereby 82,483 acres of land have been reforested. Besides this work, 22,090,738 feet of ditches have been made, draining 50,286 acres of swamps and bogs. Through the efforts of the association 132,769 acres of unproductive forest land have been reforested or drained during the last 20 years. The association has about 11,000 members and more than 400 local associations throughout the country. A magazine is published for its members. Recently the association sent an expedition of Norwegian foresters to the devastated regions in France and undertook to reforest a considerable area.

The Norwegian Forest Owners' Association is a powerful combination of forest owners, established chiefly to regulate the prices of saw logs. Questions of floating, logging, etc., are also on their program. This association has a number of branches in various parts of Norway. In several districts the forest owners have established selling associations, which undertake to dispose of saw logs for their members. These selling associations have been very beneficial, especially to the smaller forest owners, who thus have been able to obtain better prices for their logs and to maintain a firmer stand in their dealings with the sawmills and pulp mills.

FOREST FIRES.

While in centuries past nearly all the Norwegian forests have been burned over, the forest fires in Norway do not at the present time cause any considerable damage, mainly due to the efficient forest fire patrol system which has been instituted in most of the Provinces of Norway. The absence of underbrush, the moist climate, the snow cover in the wintertime, and the open stands prevent the spread of forest fires over such extensive areas as in many other countries.

There are no absolutely reliable statistics in regard to forest fires in Norway. During the period 1870 to 1900 it has been estimated that an average of about 900 acres were burned over each year. For the last few years the statistics for the whole country show the following figures:

	Acres.
1913	370
1914	1, 500
1915	980
1916	3, 800
1917	790

The damage caused by forest fires in Norway is therefore comparatively small.

MUTUAL FOREST FIRE INSURANCE CO.

Norway is one of the few countries in Europe having a forest fire insurance company. The Norwegian Mutual Forest Fire Insurance Co., which was established a few years ago by some of the most prominent forest owners in Norway, has been growing very rapidly, as shown by the following statement, which gives the value of the forests insured:

1912	$12,100,000	1916	$32,900,000
1913	16,700,000	1917	44,200,000
1914	22,600,000	1918	58,900,000
1915	27,600,000		

The insurance covers the forest floor and young stands not having reached maturity. Mature stands can not be insured. It is left to the forest owner to decide what dimensions of timber he desires to cover by insurance. A maximum diameter at breast height is generally stipulated; for instance, 7 inches at breast height. In such cases all trees having a diameter smaller than 7 inches will be covered by insurance. The insurance value must not exceed the market value of the insured trees.

The rates of insurance in 1918 were as follows: Forests in districts having a fire patrol system, 0.125 per cent; forests in districts not having a fire patrol system, 0.175 per cent. In special cases extra premiums may be charged, but usually are not in excess of 0.5 per cent. No insurance is taken for less than five years, but after four years a reduction of 20 per cent on the premiums is given to the policyholders.

The company works for improved forest fire patrol service in all districts in Norway.

Besides Norway, the only European countries having forest fire insurance companies are Holland, Germany, Denmark, and Finland.

VALUE OF TIMBERLAND.

Statistical material of recent date on the value of timberland is limited. The latest figures obtainable covering the whole country were completed in 1907 and give the average value per acre of the productive forests in each Province of Norway. Since that time the forest values have increased very materially, and the values given below only serve to indicate the relative value of the forests by Provinces.

Smaalenene	$15.40–$19.40	Southern Bergenhus	$10.90
Akershus	16.20– 21.90	Northern Bergenhus	$6.50– 8.50
Hedemarken	6.50– 21.90	Romsdal	8.50– 8.50
Christians	5.30– 15.40	Southern Trondhjem	4.50– 5.30
Buskerud	9.70– 20.70	Northern Trondhjem	5.30– 7.70
Jarlsberg and Larvik	15.40– 17.50	Nordland	1.00– 2.00
Bratsberg	13.00– 21.90	Tromso	2.00
Nedenes	8.50– 13.00	Finmarken	.25– 2.00
Lister and Mandal	9.70		
Stavanger	10.90– 11.70	Average	10.90

The total value of all forests in 1907 was $153,000,000; the present value of the forests is estimated at about $250,000,000.

At the present time it is impossible to give an average value of timberland in Norway. During the war a great many people invested their money in timberland because it was considered a safe investment. The values of forest land were boosted beyond all reason, and a great many of the present owners, who acquired their holdings during the war, will likely never obtain a satisfactory return on their investments. During the latter part of the war the prices of saw logs increased 300 per cent above prewar figures, and the value of timberland increased correspondingly.

As an example of the reckless speculation in Norway during the war, it may be mentioned that a large area of timberland in the southern part of Norway was purchased by a person without any definite idea of what the forest contained. After the purchase was made the owner cruised the timberland and ascertained, to his surprise, that in order to make a profit he had to obtain at least $140 per thousand feet for the lumber produced. At that time the market value of lumber was $61 per thousand feet.

LOANS ON FOREST LANDS.

In order to prevent holders of timberland from excess cutting during stressed times, the Norwegian Government has arranged for the granting of loans on very favorable terms against mortgages on forest land and similar property. The Norwegian Hypothecary Bank was established for this purpose in 1851. Loans amounting to three-tenths of the value of the forests, based mainly on the annual increment, are granted. The interest is considerably lower than the prevailing rate charged by private banks and during normal times is about 4 to 4½ per cent. These loans fall due in 47 years and are payable in half-yearly installments.

The forests to be mortgaged are carefully surveyed and a certain control is exercised by the bank in regard to the cutting and forest management.

A few semiofficial institutions grant loans on forests on similar conditions.

TAXES.

The forests are usually not heavily taxed in Norway. There is a small fixed tax based on the value of the property, but the principal taxes are levied on the cut logs—usually about 10 per cent of the income derived from their sale. Large holders pay considerably more, as their incomes are usually subject to excess profit taxes, which may at the present time be from 30 to 45 per cent on the income derived from their holdings. During the latter part of the war taxes were raised considerably and have not yet decreased.

In some cases the taxes are based on the estimated annual increment of the forests, which is considered as the forest owner's income. This annual increment is not figured at less than 2 per cent and not larger than 5 per cent. For instance, if a forest is worth $100,000 the income is estimated at $2,000 to $5,000, representing the value of the annual increment.

LAWS CONCERNING FORESTS AND THEIR MANAGEMENT.

Until recently there were few regulations and laws controlling the cutting and management of private forests in Norway. It has largely been left to private-forest owners to cut as they deemed best, and there are no State laws regarding compulsory reforestation of cut-over lands, as in Sweden and Finland. Most of the regulations in effect until recently dealt only with the management and cutting of the public and semipublic forests.

The first laws concerning the management and cutting of private forests were passed in 1908. According to these laws it is left to each Province to decide upon and establish rules for the cutting of such areas as are located close to the timber limit, near the coast, or in other locations where these forests may serve as a shelter against winds, sandstorms, etc., thereby protecting agricultural lands and preventing the lowering of the timber line through reckless cutting.

It will be noted that the Government only passed this matter over to the local administration in each Province. The Government, however, partly defrays the expenses in connection with the enforcement of the regulations which the provincial governments or other local authorities may establish. It is also left to these local administrations to levy special taxes on the logs cut in their districts to defray the expenses for supervision and enforcement of the laws and also for planting and reforestation.

Some years ago a number of counties and communes adopted special cutting regulations in order to prevent reckless cutting. Nearly all of these regulations are based upon the cutting of trees having a larger diameter at breast height than specified in each case as the minimum. These rules generally apply to timber cut for commercial purposes. Such cutting regulations must be confirmed by the State.

In some counties official inspectors have been appointed to enforce the cutting regulations, and in many sections no cutting can be done unless the trees are marked by such inspectors.

In a great many counties there were no laws in regard to the cutting, and during the early part of the war a heavy excess cutting took place in the Norwegian forests, which caused a great deal of apprehension. The Government passed a law in 1916 providing that in all counties and communes where no regulations in regard to the cutting of timber were in effect no timber having a smaller diameter than 8 inches at breast height should be cut. It will be noted that this law only applies to the districts where no previous regulations are in force. In many sections of Norway the local regulations permit the cutting of timber of smaller dimensions than specified in the general law. In such cases the national law is not effective.

These are the only laws limiting the cutting in Norwegian forests. It is not believed by the people in Norway that they will materially better the conditions of the forests, as they are not based on the principles of rational forestry. It is evident that a great many defective trees and much scrubby growth will be left in the forests by this cutting method after the merchantable timber has been taken out.

Compared with the Swedish and Finnish forest laws, the Norwegian laws are very lax, but it should be remembered that the conditions in Norway are different, particularly in regard to the topographical nature of the country and the ownership of the forests.

In 1918 a law was passed to the effect that trained foresters shall be employed to manage the forests belonging to counties and communes.

The shipment of lumber, cellulose, wood pulp, paper, and other forest products manufactured from timber cut in the forests of northern Norway (Provinces of Nordland, Tromso, and Finmarken) to other Provinces in Norway or to foreign countries is prohibited by a law passed in 1918. An exception is made for products manufac-

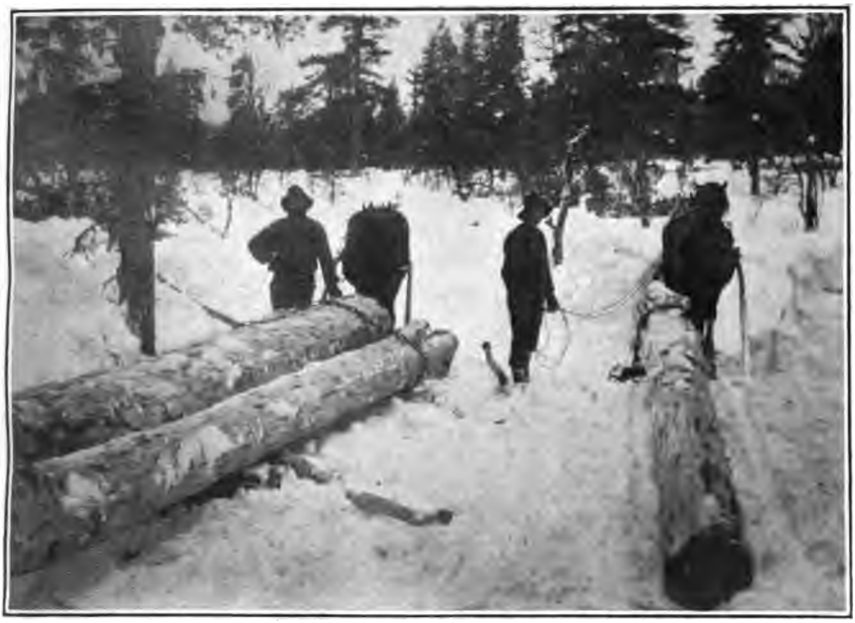

FIG. 13.—DRIVING OF HEAVY LOGS IN STATE FORESTS.

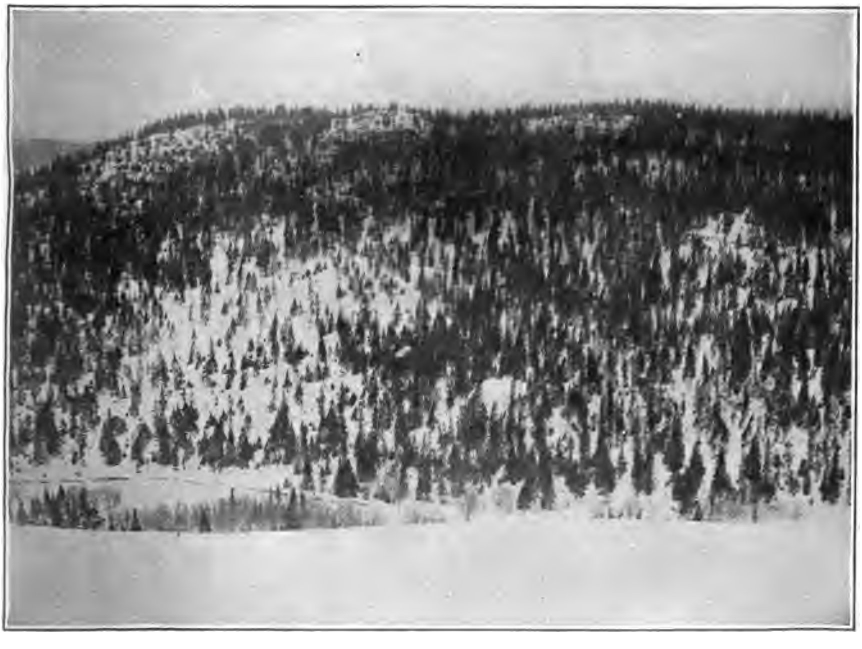

FIG. 14.—EFFECTS OF DIMENSION CUTTING.

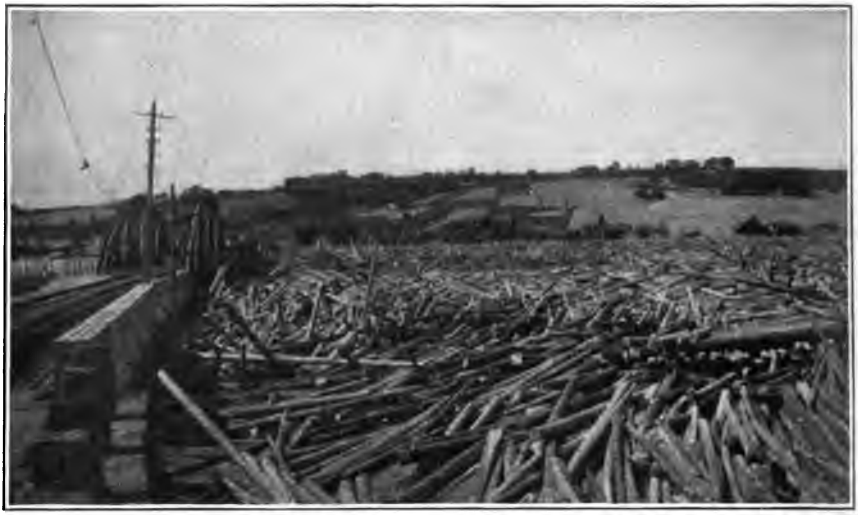

FIG. 15.—LOG JAM.

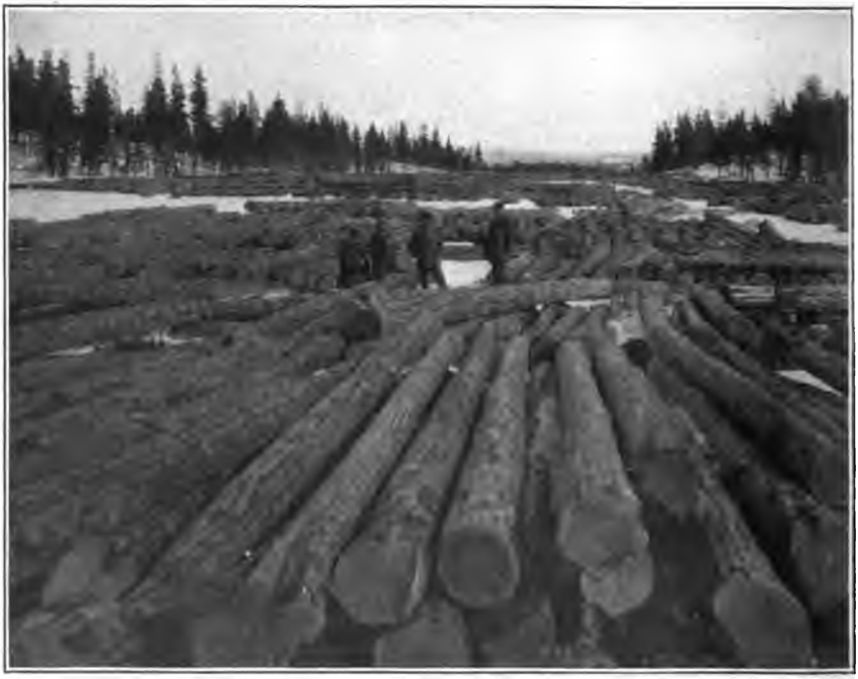

FIG. 16.—TIMBER PILED ON RIVER BANK.

tured from broad-leaf trees, firewood, and a few other specialties. Wood products originating in other countries may, however, be re-exported from this territory. Timber cut in State forests is exempt from this law. In certain cases license for export may be granted. The limited forest areas in northern Norway are not sufficient to cover the needs of this territory.

LOGGING.

On account of the extensive division of forest lands in Norway, the logging operations are generally conducted on a small scale. Only the larger forest owners and wood-using industries that have their own forests log in the way commonly used in Sweden and Finland, where several hundred men are often employed in logging and floating operations. Logging operations carried on by individuals who contract for the cutting of timber on forest lands belonging to other parties may at times have large proportions, but are generally not confined to any one forest area from one year to another. The majority of the logging operations are carried on by the peasants and small holders of timberland, who employ only a few loggers.

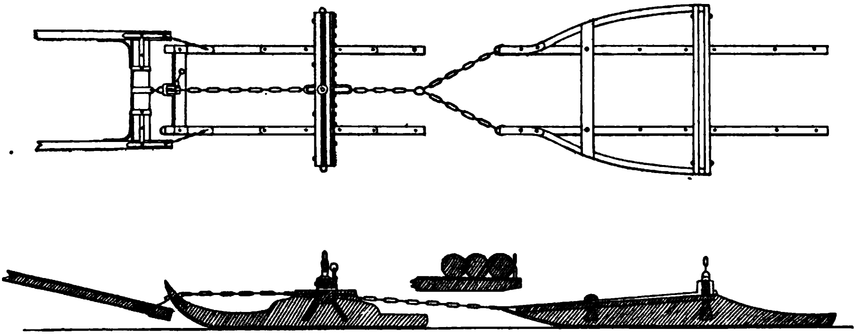

FIG. 17.—Types of sleds used in log driving.

The system of logging is the same as is found in Sweden and Finland, with a few exceptions dictated by the difference in topographical conditions. The Norwegian forest areas are of a mountainous character, and the valleys have steep hillsides which greatly hamper the logging operations. Only in a few districts in eastern Norway and in Trondelagen is the country fairly level.

Before the actual logging operations commence the trees to be cut are marked, logging roads surveyed, and log cabins constructed. Logging generally begins when the ground is frozen, which usually occurs during October or November, and is carried on until spring. Only firewood and pulp logs are cut the year around.

The cutting system followed in most of the Norwegian forests is that of dimension cutting where only trees measuring at breast height in excess of a certain minimum diameter are cut. In the better-managed forests a more scientific system is followed. (For a description of cutting systems, see the report on the lumber industry of Sweden, previously referred to.)

Axes are generally used in felling, but in the better-managed forests the loggers use saws. The loss of material by using axes in felling trees is at least 6 to 8 per cent of the log, but it is claimed in Norway that by giving the butt end a pointed shape the damage caused to the logs during the process of floating is less than when the ends are square. Many of the logging operators are careless in leaving high stumps, but in the better-managed forests the stumps seldom exceed 3 to 4 inches in height on level ground. After being cut, the trees are limbed and barked. The barking of saw logs is compulsory in most of the Norwegian forest districts.

It is not generally customary to employ expert cross cutters, but the cross cutting is left to the loggers. Only the largest logging companies maintain special cross-cutting service.

DIMENSIONS OF CUT LOGS.

The log dimensions vary a great deal in the different districts. Where the taper of the trees is large the log lengths are cut shorter. Saw logs are seldom cut in excess of 30 feet and are usually not longer that 26 to 27 feet. In some of the principal rivers the average log length is 21 to 23 feet, while in the minor floating rivers the average length may be 16 to 18 feet. The smallest lengths vary from 13 to 16 feet.

The top diameter seldom exceeds 13 to 14 inches. In districts where the pulp mills operate the smallest dimensions of saw logs are about 6½ to 7 inches. In other districts where sawmills alone are operating the minimum dimensions may be as small as 3½ to 4 inches. The minimum dimensions of spruce saw logs are usually higher in cases where both sawmills and pulp mills operate in the same district, as the pulp mills take spruce and pine logs only in limited quantities.

In some cases the logs are not crosscut in the forests but floated in entire log lengths, whereby a closer utilization of the trees may be effected. The logs are cut on odd and even feet or on the half meter in length and on the one-half inch, or odd and even centimeters in top diameter.

Although the metric measurement is standard by law, it is not in general use in the lumber industry in Norway. There seems to be an endless confusion in regard to the scaling and measuring of logs, and no two districts in Norway employ the same standard or methods of measurement. In some districts the log scaling is based on the top diameter, while the diameter at the middle is made the basis in other sections of the country. Cubic feet, cubic meters, loads, etc., are used in different parts of Norway. It is, therefore, impossible to work out a satisfactory comparative statement in regard to log dimensions, cost of stumpage, etc., for the different districts. Steps have been taken lately to enforce a uniform method of log scaling for all districts.

The top logs are cut into pulp logs, props, or firewood in districts where the transportation of such material is possible.

The utilization of waste products in the forests is fairly intensive as a whole, but as there is a limited market in Norway for charcoal, the charcoal industry is negligible. The pulp industry, on the other hand, utilizes large quantities of waste material from the forests.

The production of wood tar is also small, although before the war Norway annually exported considerable quantities of this commodity ($142,000 in 1914).

LOG TRANSPORTATION.

As the logging operations in Norway are only carried on in the wintertime when the snow covers the ground, sleighs are used in log driving. The usual type of sleigh is seen in figure 17. Sometimes a large number of logs are connected by chains, one after the other, and skidded on the ground.

The logs are driven from the place where felled to a centrally located point on the main logging road, where they are loaded on sleighs and then hauled to the nearest waterway suitable for floating and piled on the river bank or on the ice. As the logging roads are usually very steep, the loads seldom exceed 70 to 80 cubic feet. The average load is probably about 50 cubic feet.

There are no mechanical devices in Norway for the transportation of saw logs, and horses are used exclusively for this purpose.

Water transportation facilities in Norway are as favorable as in Sweden and Finland. There is hardly an important forest area in Norway more than 5 to 8 miles from a floating river.

The logs are scaled on the river bank. The scaling is generally performed by a semiofficial organization and not by buyers or sellers. By this arrangement an impartial log scaling is insured, which represents a great improvement on previous often questionable methods.

The logs are marked with the owner's brands, which are cut into each log in several places, so as to facilitate the sorting of the logs according to ownership in the sorting basins at the mouth of the river when the floating is finished.

LABOR IN LOGGING OPERATIONS.

Forest operations and farming are usually closely connected in Norway. The logging operations start at the time of the year when the farm work stops and conclude at the time when the farming operations are resumed in the spring. The Norwegian farmers are thereby enabled to find employment throughout the year.

The loggers in Norway are generally small farmers and there is not such a large number of "floating" loggers as is found in many other countries. These conditions are favorable to the forest owners, as it stabilizes the labor market. The Norwegian loggers are very proficient in their work.

The climate of Norway is healthful, although the temperature may be as low as 40° to 50° below zero in certain sections. The loggers generally live in log cabins, which are roughly constructed, having a dirt floor, with an open hearth in the middle of the room and an opening in the roof for the smoke.

The larger companies and particularly the Government have done a great deal to better the housing conditions, and during late years many of the forest owners in Norway and the Forest Service have constructed very substantial logging camps for their crews.

As in Sweden and Finland, logging is generally done on a contract basis and straight wages are seldom paid. The loggers supply their own tools, horses, and horse feed. The contracts for logging are based on different standards, either on the number of trees felled irrespective of dimensions or on a rate per log according to size. The most satisfactory basis seems to be the cubic contents of the logs.

Before the war the cost of living in Norway was very low and the loggers generally produced most of the food, with the exception of such articles as tobacco, coffee, sugar, etc.

The following schedule, taken from official statistics, shows the average daily earnings of men engaged in forest operations in Norway before the war and during 1918:

Districts.	Fellers.		Driver (furnishing own horse).		Cruisers, planters, etc.	
	1913	1918	1913	1918	1913	1918
Southeastern and eastern Norway	$0.94-$1.60	$2.68-$4.82	$1.88-$4.02	$5.36-$9.38	$0.94-$1.07	$2.14-$2.95
Southern Norway	.94- 1.60	3.22- 3.75	1.61- 2.14	5.36- 6.97	1.07- 1.34	2.41- 3.48
Trondelagen	.94- 1.07	2.68- 3.75	1.74- 2.14	4.02- 6.97	.94- 1.07	2.14- 3.22
Northern Norway	1.07- 1.60	2.28- 3.75	1.88- 2.68	5.36- 8.04	.94- 1.07	2.14- 2.68
Average	1.16	3.06	2.11	6.11	1.04	2.92

From the above schedule it is seen that the cost of labor increased very materially during the war. In this connection it may be of interest to mention that the cost of a horse for logging operations was approximately $160 to $180 before the war. Horses sold for $800 to $1,000 during 1918 and 1919.

WORKING CONDITIONS.

There has been comparatively little trouble with the loggers in Norway, because the work is done on a contract basis and a man's income depends upon the amount of work he turns out. Besides, these people are generally property owners and are less dependent upon their wages than other workmen.

A few of the large forest owners in Norway have instituted a system similar to that found in Sweden for maintaining permanent logging crews on their properties. These forest owners generally possess extensive farm properties, scattered all around their holdings. These properties are leased to persons who agree to assist the forest owner in the logging operation during the winter, for which service adequate wages are paid. Under these circumstances the forest owner asks only a small rent for the property and sometimes no rent is paid. This system has given excellent results, although the Norwegian peasants are inclined to be more pretentious in many respects and harder to satisfy than the Swedish peasants and loggers.

Many forest owners and landowners in Norway have given large amounts of money for the betterment of the conditions of their dependents. In one case, for instance, a forest owner recently established a fund of about $200,000 for hospitals and educational facilities for his tenants, besides other benefits, such as free use of land, etc. The Norwegian, like the Swedish employers, are very humane in the treatment of their employees.

The number of farm tenants in Norway is very small, however, and they are located on only a few of the larger forest holdings.

COST OF LOGGING.

It is difficult to obtain figures of the cost of logging in Norway, for the reason that the logging operations are generally conducted on a small scale and no exact account of the cost is kept.

The following statement gives an approximate idea of the average cost of logging in cents per cubic foot:

Items.	1913–14	1918–19
	Cents.	*Cents.*
Cutting, barking, limbing, and cross cutting	0.94–1.61	2.41–4.02
Driving and piling of logs on river bank	.80–2.14	4.02–8.04
Log scaling and supervision and administration	.14– .30	.30– .45
Stumpage	4.02–9.92	14.74–21.44
Total	5.90–13.97	21.47–33.95

In cases where the forests are located at a considerable distance from a floating river the stumpage values would be low, but the cost of logging would increase correspondingly. To illustrate this the following statement showing how distance affects the cost of driving is given. It is based on a day of 10 hours, average load of 50 cubic feet, and wage of $2.11 per day (prewar schedule).

	Cents per cubic ft.
8 loads per day, distance ½ mile	0.54
7 loads per day, distance 1¼ miles	.61
6 loads per day, distance 1¾ miles	.71
5 loads per day, distance 2½ miles	.86
4 loads per day, distance 3 miles	1.07
3 loads per day, distance 3¾ miles	1.43
2 loads per day, distance 5 miles	2.14
1½ loads per day, distance 6 to 7½ miles	2.85
1 load per day, distance 8 to 10 miles	4.29

The following schedule is representative of the cost of the larger logging operations that entail considerable expense for improvement of the property, supervision, etc. The expenses are calculated per cubic foot of a year's cut in 1917–18.

	Cents per cubic ft.
Improvements and management:	
Improvement of floating rivers, drainage of swamps, etc	0.02
Planting, fences, cruising of property, and roads	.42
Taxes	2.68
Forest fire insurance	.01
Log cabins, etc	.58
Supervision and general expenses	1.00
	4.66
Logging operations:	
Cutting and barking	1.40
Driving of logs	2.00
Total cost	8.06

This cost is considerably lower than that generally found, but the particular forest area to which this statement refers is located near the sawmills in a densely populated district, and these special conditions produce a very reasonable cost of logging.

FLOATING.

No operation in connection with the utilization of the Norwegian forest products is as well organized and developed as the floating of logs.

The technic of floating has probably reached a higher state of perfection in Norway than in any other country in Europe and the Norwegian methods have found their way to other parts of the world where Norwegian capital is being invested. Logs have been floated in Norway, according to the history of the country, for more than 600 years, but on a large scale only since the seventeenth century.

The network of rivers and tributary rivers extending throughout the forest area has been of the greatest importance. Without these river systems the timber in the interior districts could have found its way to the coast and to the foreign markets only with great difficulty.

The following table shows some of the principal floating river systems in Norway and the areas drained by them:

Rivers.	Drained area.	Drained forest area.	Relation of forest area to total area.
	Acres.	*Acres.*	*Per cent.*
Glommen	6,053,970	2,713,789	45
Drammen	4,283,474	1,520,285	35
Gudbrandsdals Laagen	4,276,311	1,023,815	24
Skien system	2,663,648	680,979	26
Nid	987,259	483,379	49
Trysil	1,295,021	456,209	35
Numedals Laagen	1,389,622	407,056	29
Gula	888,212	365,560	41
Namsen	1,486,199	315,666	21
Fredrikshald system	388,531	264,043	68
Topdal	465,595	241,072	52
Orkla	738,530	229,710	31
Nea	723,463	225,017	31
Ottra	940,823	218,348	23

The rivers south of 65° north latitude are the only ones of any importance to the floating of logs. The majority of the Norwegian rivers, like those of Sweden, offer an advantage to the floating of logs by running from north to south, so that the ice first melts at the mouth of the rivers in the spring, and later the snow and ice melt in the mountain regions. These conditions prevent the accumulation of ice in the lower courses of the rivers and greatly facilitate the floating. Owing to the topographical conditions, the height of fall of most of the Norwegian rivers is very considerable. It has therefore been a difficult task for the Norwegian floating engineers to conserve the water supply to extend the period of floating as long as possible each year.

In the principal floating rivers adequate storage facilities for logs are generally found. The comparatively small numbers of lakes in the Norwegian river systems also decreases the cost of floating, as only in a few cases do the logs have to be towed.

In nearly all the Norwegian rivers there are a great many waterfalls which materially hamper the floating and cause great losses through breakage of logs. In some places canals have been constructed around the falls, through which the logs are floated, thereby avoiding a large percentage of breakage that formerly resulted when the logs passed down the falls.

A splendid piece of engineering has been done near Sarpsborg, near the mouth of the Glommen River, where a tunnel 8,500 feet long has recently been made, costing about $225,000.

In all the floating rivers important improvements have been effected, such as the construction of dams, flumes, cut-offs, buttresses, booms, etc. During recent years buttresses have been constructed of concrete.

The floating of logs starts in the spring as soon as the ice breaks. The logs are dumped into the river and carried with the flood to their destination. A close cooperation of the different floating crews in the same river is necessary in order to effect the highest possible economy with the water supply stored in reservoirs in the different sections. The floating is generally finished in one season in most of the Norwegian rivers. The season closes when the rivers freeze in the autumn, sometimes as late as in November.

When the logs are floated to a certain point in the lower course of a river they are passed through a sorting basin, where they are separated according to ownership, bundled, tied with wire, and towed to the different mills.

QUANTITIES OF LOGS FLOATED.

The average annual quantities of logs floated in Norway are shown by the following table:

Years.	Logs.	Cubic feet.	Years.	Logs.	Cubic feet.
1886-1890, average	13,572,000	115,078,000	1901-1905, average	32,152,000	171,770,000
1891-1895, average	14,316,000	122,562,000	1906-1910, average	27,317,000	174,912,000
1896-1900, average	20,059,000	157,544,000	1911-1915, average	26,300,000	159,380,000

By Provinces and districts the average annual floating during the years 1911 to 1915 was as follows:

Provinces.	Logs.	Cubic feet.
Finmarken	415,176	2,520,067
Tromso		
Nordland		
Bratsberg	4,142,916	28,348,371
Nedenes		
Lister and Mandal		
Stavanger		
Northern Bergenhus	516	5,648
Southern Bergenhus		
Romsdal	2,477,520	15,273,957
Northern Trondhjem		
Southern Trondhjem		
Hedemarken	19,264,284	113,232,763
Christians		
Akershus		
Smaalenene		
Jarlsberg and Larvik		
Buskerud		

The quantities of logs floated in some of the principal rivers of Norway are shown by the following statement, which gives the annual averages for the years 1911 to 1915:

	Cubic feet.
Glommen River	51,396,800
Drammen River system	36,214,270
Skien River system	13,237,500
Numedals Laagen River	7,638,920
Fredrikshald River system	6,177,500
Vaerdal River	3,988,900
Namsen River	3,953,600
Arendal River system	3,897,120
Trysil River	3,681,790
Kragero River system	2,965,200
Farris Lake	2,467,470
Topdal River	2,118,000
Snaasen River system	1,539,080
Lier River	1,517,900
Vegaardsheien River system	1,412,000
Ottra River	1,387,290
Moss River system	1,193,140
Stjordal River	1,059,000

As much as 75 to 85 per cent of these quantities may in many rivers represent pulp logs.

FLOATING IN THE GLOMMEN RIVER.

The floating in the Glommen River is the best organized in Norway. About 4,000 floaters are employed by the floating association operating in this river. The expenses of floating are about $1,500,000 to $1,600,000 per year, of which three-fourths represent wages.

The sorting basin in the Glommen River at Nes, where about 9,000 logs per hour are sorted, is considered the most up-to-date in Europe. The best Norwegian log-bunching machinery, operated by electricity, is capable of handling about 30,000 logs per day, which is a capacity about ten times greater than that of the common types of log-bunching machinery, operated by steam, used in other European countries.

The following table shows the annual average quantities of logs floated in the Glommen River from 1821 to 1915:

Years.	Logs.	Cubic feet.	Years.	Logs.	Cubic feet.
1821–1830, average	607,730	10,992,000	1881–1890, average	2,873,496	24,705,000
1831–1840, average	850,476	14,614,000	1891–1900, average	4,677,808	34,133,000
1841–1850, average	907,356	13,841,000	1901–1905, average	6,152,820	56,109,000
1851–1860, average	1,489,536	18,541,000	1906–1910, average	8,400,000	61,775,000
1861–1870, average	2,540,212	29,018,000	1911–1915, average	8,736,000	51,397,000
1871–1880, average	2,808,636	27,266,000			

In 1914 saw logs represented only 15 per cent of the logs floated in the lower parts of this river. Most of the logs were destined for the pulp mills. A few decades ago most of the logs floated were saw logs.

In the Glommen River a new tunnel has been planned. Its length will be about 8½ miles and will have to be blasted through a mountain. By this tunnel a considerable economy in the use of water will be effected, and the floating can be conducted without interfering with the many electric power plants in that part of the river.

The floating in the Skien River system is especially interesting because the logs must pass through several sluiced canals. In a distance of about 10 miles the logs pass through 15 sluices. The logs must in such cases be bunched and tied with wire.

CONDITIONS AFFECTING FLOATING.

Owing to the relative short lengths of the Norwegian rivers and the swift current, the floating of the logs can nearly always be finished in one year. This is a great advantage, as logs lying in the rivers from one year to another depreciate in quality, besides causing a heavy expense to the owners through loss of interest. The percentage of dead logs (sunken in the rivers) is less in Norway than in most of the other countries. It varies considerably in the different rivers, but is generally less than 2 per cent and sometimes as low as 0.75 per cent. In the Glommen River the annual average, 1906 to 1915, was 0.89 per cent. In the smaller rivers the length of the saw logs is limited. In the main rivers, however, logs up to 60 and 70 feet may be floated.

According to the law of 1887, all rivers suitable for floating are declared open for public use. The law also stipulates that when the majority of the parties interested in the floating of logs in the same river so desire the floating shall be made for mutual account through floating associations. These associations may establish their own by-laws, but the members may have these by-laws confirmed by the Government if they desire it.

FLOATING ASSOCIATIONS.

There are several floating associations operating in the principal floating districts in Norway. It is estimated that there are about 90 main floating rivers in Norway and 10 to 12 floating associations. These associations are organized on a plan similar to that used in Sweden, but the Government does not exercise any direct control over the expenditures and cost of floating, which are charged pro rata to each owner of the logs floated.

The floating associations in most cases deliver the logs at the mills when these are located on the main floating river. The logs are stored in storage basins and the mills may at any time call for the quantity of logs which they desire, thereby avoiding the necessity of providing storage space for their entire log supply at the mill.

While the floating in the main rivers is usually done by the floating associations for mutual account, the log owners must float the logs at their own expense in all tributary rivers. A new law has been proposed to make the floating of logs in all main rivers compulsory for joint account of all log owners in the same river and to require that the by-laws of the associations be confirmed by the Government.

In certain rivers in Norway some operators have for years had a practical monopoly of floating, thereby excluding other concerns from purchasing logs in the districts where they operate, and have thus secured cheap raw material. The new law aims to stop this practice.

COST OF FLOATING.

The cost of floating varies a great deal in the different rivers. A comparative statement of the cost of floating in the various rivers has never been published, for the reason that the different bases used in computing costs make it extremely difficult and almost impossible to compile such statistics. In some rivers the cost is determined according to the distance floated, while in others the cost is the same irrespective of the distance.

Prior to the war the cost of floating in most of the Norwegian rivers declined year by year as a consequence of the many improvements that were laid down in these rivers to facilitate the work. As soon as these improvements had been amortized the cost of floating was materially reduced. During the war the cost of labor and supplies increased to a very large extent, which naturally affected the cost of floating.

It appears from the records of most of the Norwegian floating associations that the cost of floating before the war varied between 0.5 cent and 1.5 cents per cubic foot. These costs apply only to the floating in the main rivers; in the tributary rivers the log owners themselves attend to the floating. On an average, the floating in the tributary rivers was estimated at about 0.3 to 0.5 cent per cubic foot. In 1918 the floating charges were about 200 to 300 per cent higher.

In this connection it may be mentioned that the wages of the floaters increased from $0.96–$1.61 in 1913 and 1914 to $3.22–$5.36 in 1918 and 1919.

The floating of logs in Norway is well worth a close study. In regard to the organization of the floating associations, the adequate laws, and the mechanical devices for facilitating the floating, Norway occupies a unique position. Without these floating facilities it would have been almost impossible to exploit the interior forest regions where forest operations to-day constitute the principal and almost only source of revenue of the population.

PURCHASE OF SAW LOGS.

Nearly all the Norwegian mills purchase their raw material as saw logs delivered at the main floating rivers in the interior forest regions. A considerable quantity of saw logs is also imported from Sweden through the floating rivers running from Sweden into Norwegian territory.

In each important district fixed price scales have been established for saw logs of different dimensions and the buyers compete by offering a certain percentage of increase on these base prices. There are a great many special regulations for each district in regard to the measuring of saw logs. It is, therefore, not possible to give any detailed comparative statement of the cost of saw logs in the various districts.

The largest market for saw logs is the Glommen River district. The following schedule shows the prices paid before the war and in 1918–19 for saw logs of different dimensions in this river. The prices quoted are for logs delivered at the river bank; they are based on a log length of 23 feet and apply to both pine and spruce; cubic measurement is calculated on top diameter.

Top diameter.	Price per cubic foot.		Top diameter.	Price per cubic foot.	
	1914–15	1918–19		1914–15	1918–19
12.2 inches	$0.157	$0.352	8.7 inches	$0.144	$0.380
11.8 inches	.165	.352	8.3 inches	.137	.388
11.4 inches	.165	.355	7.9 inches	.135	.392
11.0 inches	.165	.360	7.5 inches	.1266	.375
10.6 inches	.165	.360	7.1 inches	.114	.350
10.2 inches	.159	.365	6.7 inches	.100	.327
9.9 inches	.154	.370	6.3 inches	.084	.310
9.5 inches	.153	.375	5.9 inches	.070	.290
9.1 inches	.150	.375			

The above table indicates how the top diameter dimension affects the prices. For logs with a top diameter greater than 12.2 inches, an increase in price of 2.7 cents per log is paid for each one-fourth inch top diameter in excess of 12.2 inches up to 15.75 inches.

The prices are usually about the same for logs 19½ feet and up. Lengths of 16 and 18 feet are sold at 5 to 10 per cent lower prices per cubic foot.

Following are prices of logs from State forests in the Glommen River district. They are based on a log length of 24 feet and top diameter of 9 inches.

	Price per cubic foot.		Price per cubic foot.
1878	$0.050	1900	$0.078
1879	.050	1901	.067
1880	.067	1902	.076
1881	.065	1903	.080
1882	.067	1904	.072
1883	.063	1905	.074
1884	.065	1906	.084
1885	.061	1907	.082
1886	.059	1908	.080
1887	.053	1909	.101
1888	.061	1910	.112
1889	.069	1911	.118
1890	.063	1912	.143
1891	.065	1913	.162
1892	.057	1914	.164
1893	.061	1915	.170
1894	.063	1916	.192
1895	.065	1917	.373
1896	.072	1918	.392
1897–1899	.074		

During the past few decades the market for pulp logs has grown to be the most important in the Glommen River district. The following schedule shows the average prices per cubic foot of pulp logs from 1891 to 1918. The cubic measurement is based on diameter at the middle of the log.

	Cents per cubic foot.		Cents per cubic foot.
1891	3.6	1905	4.4
1892	3.6	1906	4.7
1893	3.2	1907	5.1
1894	3.2	1908	5.2
1895	3.5	1909	4.9
1896	3.5	1910	5.3
1897	3.8	1911	6.8
1898	4.4	1912	7.6
1899	4.4	1913	8.5
1900	4.7	1914	8.7
1901	4.7	1915	9.1
1902	4.2	1916	11.4
1903	4.3	1917	19.0
1904	4.4	1918	19.7

In the Drammen River district, which is next in importance to the Glommen River district in regard to the number of logs floated, the prices are about the same as in the Glommen River. In the Skien River system the prices of saw logs are approximately 10 per cent lower than in the Glommen district.

In the Trondelagen district the market for saw logs is not important and the prices are frequently lower than in the districts in eastern Norway, because the competition for saw logs in that part of the country is not so keen as farther south.

FACTORS THAT AFFECT PRICES OF LOGS.

The combination of mill owners to lower the prices of saw logs has not been very successful in Norway, because the competition is too keen and the raw material scarce. At times the forest owners have suspected that the purchasers had formed such combinations, and in order to break these rings and to stimulate competition the forest owners have established their own pulp factories and lately have threatened to establish sawmills.

The forest owners, through their association, are kept in constant touch with the market for Norwegian forest products abroad, and as soon as the prices advance in the foreign market the forest owners also advance the prices of their saw logs.

At times the pulp mills must take both pine and spruce logs in order to obtain the quantities of spruce which they need. As only limited quantities of pine logs are desired by the pulp mills, they have had to dispose of the surplus pine logs either by selling them to the sawmills or by exchanging them for spruce logs. In some cases the pulp mills have established sawmills where they saw these pine logs into lumber. This has created serious competition for the sawmills, because the pulp mills compete with the sawmills both in purchasing logs and in selling lumber. The lumber business is only a branch activity with the pulp mills, on which they do not expect to make any profit, but in which they have been forced to engage to dispose of the surplus pine logs.

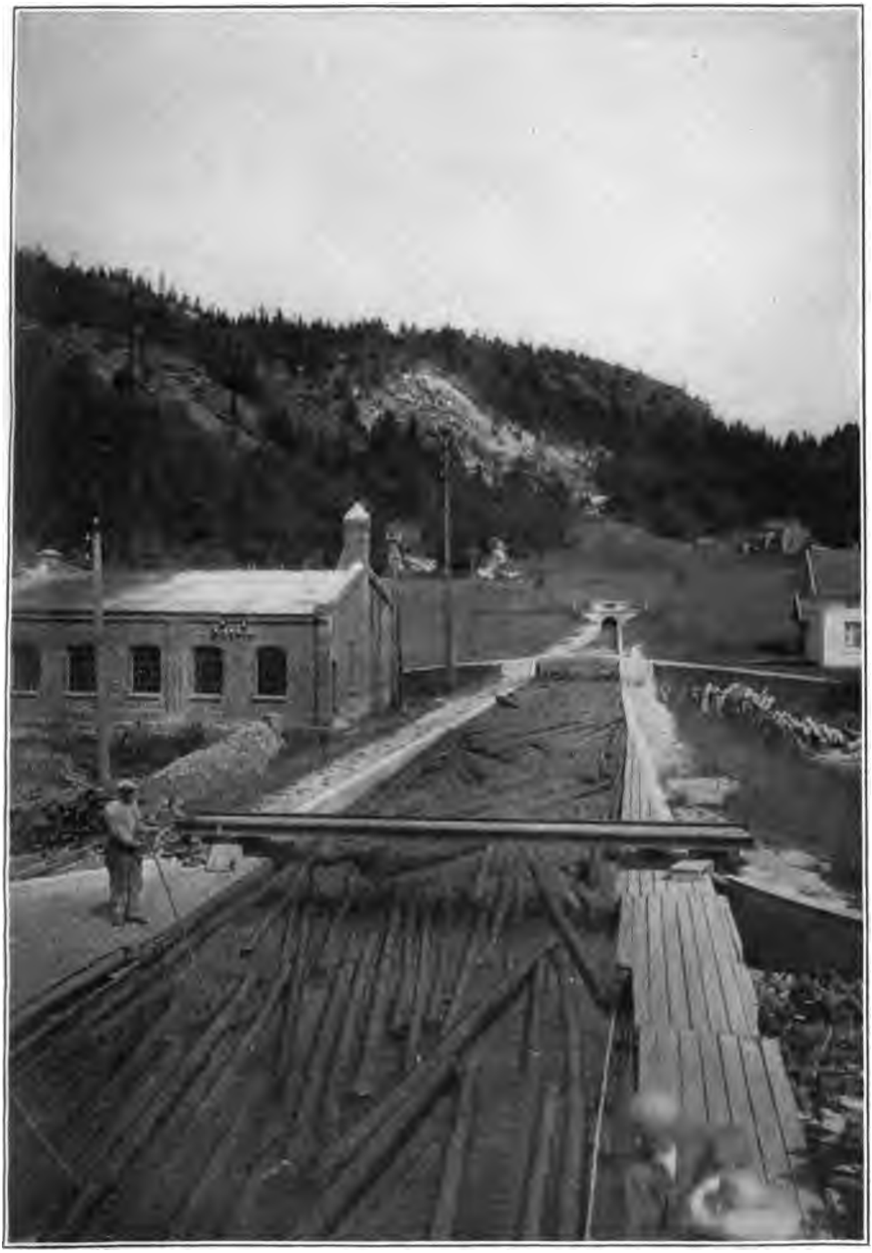

FIG. 18.—TUNNEL FOR FLOATING TIMBER ON GLOMMEN RIVER.

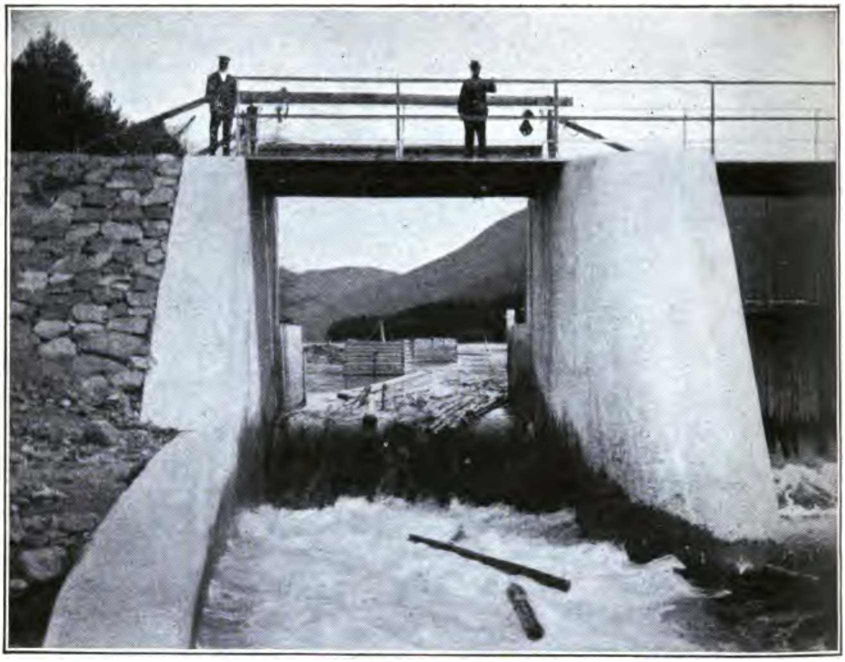

FIG. 19.—DAM IN SKIEN RIVER SYSTEM.

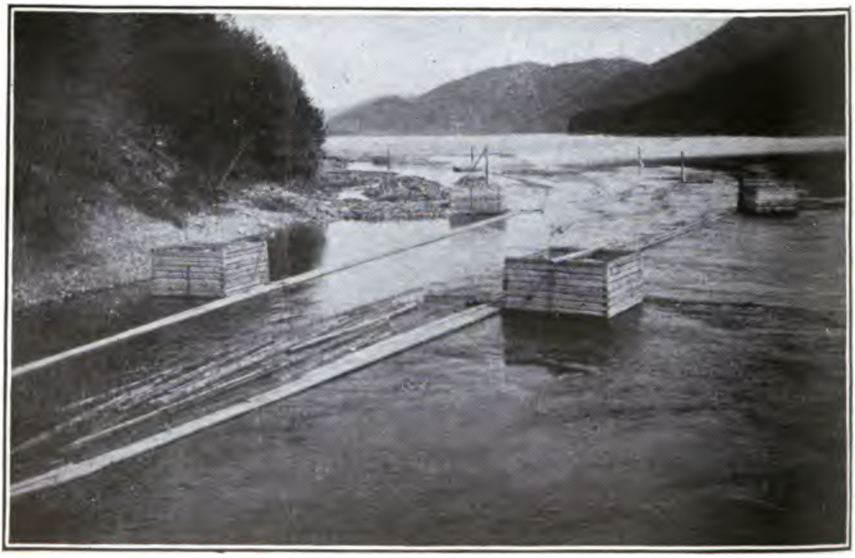

FIG. 20.—BOOMS IN SKIEN RIVER SYSTEM.

The obtaining of raw material for the wood-using industries has for some time been a serious problem. The pulp and paper industries can generally afford to pay higher prices for logs than the saw and planing mills. In the Glommen River a few decades ago 80 to 85 per cent of logs floated were saw logs and 15 to 20 per cent pulp logs. During recent years these percentages have been reversed. Conditions are the same in the Drammen River, the floating river second in importance, where the saw logs now constitute only 12 to 20 per cent of the total quantity floated.

When the prices of saw logs culminated in 1918 the sawmills in many districts ceased buying and were fully prepared to curtail production, as it was considered too risky to pay the high prices for saw logs which the forest owners demanded. It should be considered that logs bought at midsummer one year do not generally reach the mills before the autumn of the following year, and in addition from six to eight months pass before the lumber cut from such logs is ready for shipment. The sawmill operators must, therefore, carefully consider the future markets abroad when they purchase saw logs.

LUMBER MANUFACTURE.

SAWMILL INDUSTRY.

Lumber manufacture is one of the oldest industries in Norway, and the production of lumber and timber can be traced back to the earliest times in the history of the country.

It is very interesting to see the woodwork in some of the old Viking ships which have recently been found buried in the ground. These ships were constructed about a thousand years ago and have exquisite woodwork, such as moldings, planed boards, and carved work, which clearly shows that this craft was highly developed at that time. Several of the old churches and buildings in Norway, built six or seven hundred years ago and still remaining in good condition, bring out the same points.

The first sawmills in Norway were constructed about the year 1500, and were operated by water power. The development of the lumber industry was to some extent hampered during the following centuries by restrictions imposed by the Government to prevent the cutting out of forest areas. Besides, the operation of sawmills was made a special privilege, granted by the Government to certain individuals.

The last of the restrictions on the sawmill industry were abolished in 1860, and from that time the industry has greatly developed, especially since the introduction of steam sawmills. While formerly the location of the mills was dependent upon the waterfalls, the introduction of steam power made it possible to construct mills close to the ports at the mouths of the floating rivers. For the export of lumber this was an important step, because the loading of vessels and the shipment could be effected easier than when the lumber had to be shipped to the port from interior mills.

After the Franco-Prussian War the demand for lumber was very great, and for some time the Norwegian mills were unable to satisfy the demand, so that foreign lumbermen came to Norway and built new mills in order to increase the output. This boom lasted only for a short time, and a reaction followed that brought about a great many changes in the Norwegian sawmill industry. The lumber industry did not develop to the extent expected during the following decades, which must be attributed largely to the development of the pulp and paper industries.

Although lumber production in Norway has probably reached its highest point and may be expected to decrease, a study of the industry is interesting, because it shows how the scarcity of raw material and the high cost of stumpage have forced the lumbermen to effect the closest possible utilization of the raw material.

The Norwegian wood-using industries occupy a unique position by producing chiefly pulp, paper, and semimanufactured wood products, such as planed lumber, box shooks, etc., while the other northern European countries are producing mainly timber and sawn lumber and are manufacturing a much smaller percentage of their wood into pulp, paper, planed lumber, etc.

The greater part of the lumber exported from Norway is planed lumber and box shooks, while rough lumber plays a comparatively insignificant part in the export trade. Among the wood-using industries in Norway the lumber industry is of secondary importance.

IMPORTATION OF RAW MATERIAL.

As a consequence of the increased prices for Norwegian saw logs, the sawmills and planing mills have for some years past imported considerable quantities of raw material from Sweden, Finland, and Russia. A few years before the war even Canadian spruce was imported into Norway, resawn and planed, and reexported together with Norwegian stock. The inferior quality of Canadian spruce, however, made the Norwegian mills abandon this trade, as it threatened to damage the reputation of the Norwegian shippers.

The Norwegian import statistics do not give information in regard to species, dimensions, and degree of manufacture of the lumber imported from these countries. The statistics merely use the term "wood."

The Norwegian import statistics for 1913 give the following data in regard to the importation of Swedish, Finnish, and Russian wood:

	Cubic feet.
From Sweden	8,764,000
From Russian Baltic ports	11,176,000
From Russian White Sea ports	1,768,000
From Finland	3,845,000
Total	[a]25,553,000

The Russian statistics do not give any clear idea of species and kinds of wood that were exported to Norway during this year.

In the Finnish and Swedish export statistics the following data are given:

Export from Finland to Norway, 1913:		
Pit props, pulp wood, etc	cubic feet	2,758,000
Rough lumber	M feet	3,454
Split wood	cubic feet	381,000
Export from Sweden to Norway, 1913:		
Round timber, props, pulp wood, etc	cubic feet	6,100,000
Hewn timber of all kinds	do	96,000
Split wood	do	753,000
Rough lumber	M feet	49,364
Planed lumber	do	19,725

It is difficult to determine how much of the wood imported from Sweden, Finland, and Russia was reexported, either as rough lumber or manufactured into planed stock and box shooks, and how much was used locally. Considerable quantities of lumber were imported into the western and northern coastal regions of Norway before the war for local use, as these districts have only limited forest areas. It is safe to assume that by far the greater part of the material imported was destined for reexportation, either in the same form as imported or manufactured into planing-mill products.

The freight rates from the Baltic ports of Finland and Russia to

The freight rates from the Baltic ports of Finland and Russia to the the southeastern ports of Norway were approximately $3 to $3.75 per thousand feet board measure before the war. Since the waronly limited suantities of wood have been imported from Finland and Russia.

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[a] These figures include wood imported for domestic use and for reexport and do not compare with figures on page 27, which refer to raw material imported for reexport.

Several Norwegian companies operate small sawmills in the Swedish Provinces bordering the railroad lines between the two countries. The rail freight rates from the Fryken district adjacent to Lake Wenner in central Sweden to the southeastern ports of Norway were about $2 to $3.50 per thousand feet board measure before the war and $3.50 to $6.50 in 1918 and 1919. The rate from the sawmill regions in the Province of Jamtland, Sweden, to the ports on the Trondhjem Fiord were approximately $1.35 to $1.65 per thousand feet in 1913 and $4 to $7 in 1918 and 1919.

The Swedish sawn stock is usually superior in both quality and manufacture to the Norwegian lumber cut by the small or portable mills.

MILL PRODUCTION.

The quantities of rough lumber produced for export in Norway during the years immediately before the war were very small, averaging about 80,000,000 feet board measure annually, or not more than the output of one of the many large American export mills, and over 50 per cent of this quantity was imported from Sweden and Finland. The total quantities of rough and planed lumber produced for export during normal times in Norway were not larger than the annual output of the largest sawmill in the United States.

Although the lumber industry in Norway is not very important when compared with the lumber industries in Sweden and Finland, the lumber produced for export plays an important part in the world's markets, because Norway is one of the few lumber-exporting countries in Europe able to ship the year around.

Were it not for the advantageous position of Norway within easy reach of the principal lumber-importing markets of the world, its lumber industry would play a rather insignificant part in supplying the world's markets.

The terminology of the Norwegian lumber trade has a great many specific denominations to designate various dimensions of lumber. In this report the same terms will be used as were employed in the Swedish and Finnish reports, as follows:

Planks: 2 inches and up in thickness, 8½ inches and up in width.
Battens: 2 inches and up in thickness, from 6 to 8½ inches in width.
Scantlings: 2 inches and up in thickness, less than 6 inches in width.
Boards: Less than 2 inches in thickness, 6 inches and up in width.
Narrow boards: Less than 2 inches in thickness, less than 6 inches in width.

The latest official statistics covering the production of lumber in Norway were published in 1909. The total number of sawmills and planing mills was given as 735 plants employing 12,702 hands. The following details were given: Sawmills, 467, employing 4,727 hands; sawmills operated in connection with planing mills, 211, employing 5,956 hands; sawmills operated in connection with planing mills and box factories, 15, employing 1,153 hands; sawmills operated in connection with planing mills, sash and door factories, 29, employing 808 hands. The others were small mills operated in connection with other industries. The value of the total production of rough and planed lumber was given in 1909 as $6,800,000 for rough lumber (including firewood) and $8,000,000 for planed lumber; total, $14,800,000. Of rough lumber 47,498,000 cubic feet and of planed lumber 28,723,000 cubic feet were produced.

Preliminary statistics for 1916 have been obtained and are given below. It should be noted, however, that these figures are not comparable with those for Sweden and Finland, because the Norwegian statistics take in a large number of small mills that would not be included in the Swedish and Finnish statistics.

Provinces.	Sawmills and planing mills.	Employees.	Planks and battens, rough.	Boards, rough.	Construction lumber, rough.	Total rough lumber.	Planed lumber.
			M feet.	*M feet.*	*M feet.*	*M feet.*	*M feet.*
Smaalanene	154	3,610	23,311	1,749	2,170	27,230	101,636
Akershus	204	2,303	22,945	7,066	3,098	33,109	13,860
Christiania	18	288	465	149	178	792	19,074
Hedemarken	223	1,481	32,669	3,667	1,916	37,532	2,216
Christians	126	527	2,228	545	971	3,744	2,212
Buskerud	99	905	15,000	1,143	1,560	17,703	11,964
Jarlsberg and Larvik	94	834	30,707	5,147	1,091	36,945	23,984
Bratsberg	43	706	9,059	2,322	1,615	12,996	516
Nedenes	71	552	11,705	1,805	705	14,215	1,716
Lister and Mandal	106	534	7,643	123	575	8,341	1,689
Stavanger	36	123	946	490	159	1,595	1,741
Southern Bergenhus	31	77	71	1,012	38	1,121	....
Bergen	16	55	....	....	....	....	1,528
Northern Bergenhus	28	94	245	1,105	....	1,350	....
Romsdal	75	347	655	532	1,211	2,398	....
Southern Trondhjem	118	858	6,776	2,180	572	9,528	2,112
Northern Trondhjem	135	1,253	17,743	6,676	1,599	26,018	9,574
Nordland	37	222	254	579	26	859	318
Tromso	10	33	35	60	28	123	....
Finmarken	3	13	330	68	....	398	....
Total	1,627	14,815	182,787	36,418	16,792	235,997	194,140

Provinces.	Total rough and planed.	Staves.	Cull stock, firewood, etc.	Box shooks.	Sawn railroad ties and mining timber.	Total value of production.
	M feet.	*M feet.*	*Cubic feet.*	*M feet.*	*Cubic feet.*	
Smaalenene	128,866	1,613	3,090,656	48,567	106,500	$9,827,290
Akershus	46,969	496	3,193,062	5,856	85,673	2,084,217
Christiania	19,866	....	862,591	....	....	1,130,212
Hedemarken	39,748	....	1,288,838	1	....	1,276,363
Christians	5,956	72	257,337	....	5,295	275,857
Buskerud	29,667	1,388	1,190,351	159	5,295	1,372,238
Jarlsberg and Larvik	60,929	1,973	2,135,932	7,468	19,274	2,931,562
Bratsberg	13,512	201	1,905,600	....	1,337,411	1,284,333
Nedenes	15,931	887	929,837	660	953,276	1,117,574
Lister and Mandal	10,030	6,439	587,992	281	74,271	849,299
Stavanger	3,336	....	3,283	....	3,212	133,761
Southern Bergenhus	1,121	50	21,180	....	....	112,929
Bergen	1,528	....	....	....	....	71,479
Northern Bergenhus	1,350	416	16,802	25	7,413	56,886
Romsdal	2,938	1,867	32,511	88	....	460,809
Southern Trondhjem	11,640	252	748,749	....	6,849	1,118,666
Northern Trondhjem	35,592	534	2,957,858	2,228	18,956	2,183,572
Nordland	1,177	....	202,657	....	....	120,850
Tromso	123	4	212	....	....	6,572
Finmarken	398	....	19,521	3	....	21,259
Total	430,137	16,192	19,444,969	65,336	2,623,425	26,435,728

The large number of small mills in Norway indirectly play an important part in the lumber export trade, because they furnish large quantities of raw material for the Norwegian export planing mills and box factories.

Most of the large mills are located in the vicinity of Christiania Fiord, on the southeast coast of Norway, and in the Trondelagen district as far north as about 65° north latitude. North of this line and in western Norway there are practically no important mills, as the forest area is very limited and the exportation of lumber is prohibited from the three northernmost Provinces. In this report, therefore, the lumber industry in Norway will be considered as lying south of 65° north latitude.

Most of the large mills are located on the seacoast, while the smaller mills not cutting for export are scattered all over eastern and southeastern Norway.

The principal mills are located at or in the vicinity of the following ports: Fredrikstad, Fredrikshald, Christiania, Drammen, Larvik, Christiansand, Trondhjem, and Namsos. The two last-mentioned ports are in the Trondelagen district.

Most of the larger mills are either operating pulp factories or are in some way or another allied or connected with the pulp and paper industry. A few mills also operate door factories, plants for grinding wood flour, oxalic-acid factories, or plants for generating electric power.

It is generally conceded in Norway that the price of raw material is so high that mills can not operate by producing rough lumber alone, at least not if the mills are located in the southeastern parts of Norway and dependent upon raw material from other sources than from their own forests. Every cubic inch of the log must be utilized in the most efficient way; otherwise the mills can not compete with other plants. This statement refers only to standard mills, as there will always be a great number of small portable mills in the interior districts where stumpage values are comparatively low and the markets for waste material unsatisfactory, so that these mills are unable to operate in the most rational way.

So far as could be learned, no foreign capital is interested in Norwegian saw and planing mills.

EXPORT SAWMILLS.

The Norwegian export mills are generally much smaller than the export mills in Sweden and Finland. The average capacity of a standard Norwegian export mill may be from 6,000,000 to 8,000,000 feet, board measure, annually. In this connection it must be remembered that the Norwegian sawmills do not generally possess their own timberland, and that raw material is higher in Norway than in the other north European countries.

With the unsatisfactory conditions in regard to the supply of raw material, it has seldom been advisable for the Norwegian operators to construct large plants, and it is often seen that small plants may operate more economically than the larger plants. It is easy to close down a small plant in critical times, and as the labor situation in Norway, particularly during the war and afterwards, has been unsatisfactory, the losses incurred through temporary suspension of the sawmill operations in Norway have not been so considerable as would have been the case if the mills were of a larger capacity.

The largest export mill in Norway has a capacity of only 40,000,000 board feet. This output, however, includes box shooks, planing mill products, and rough lumber. The export mills on the east side of Christiania Fiord and the mills in the districts of Drammen and Larvik specialize in planed lumber and box shooks, while the other districts turn out mostly rough stock for export.

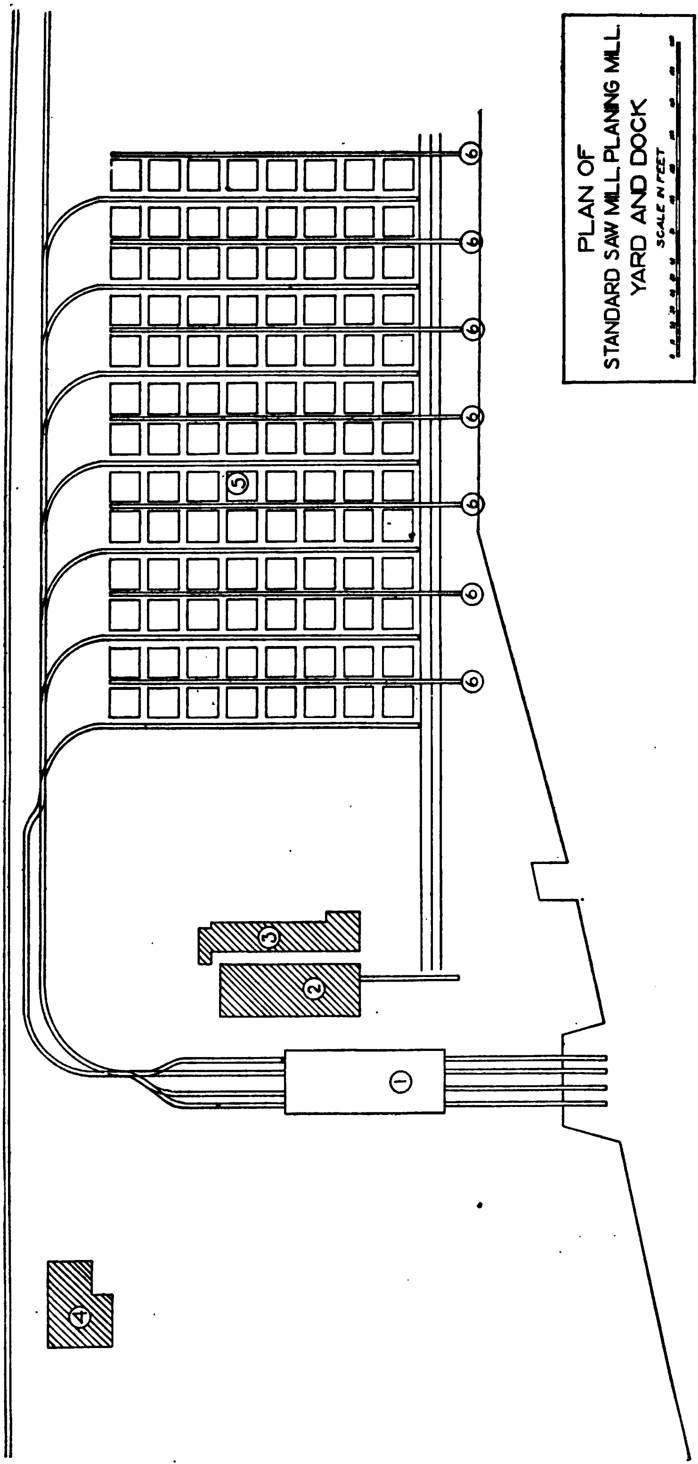

FIG. 21.—Ground plan of standard sawmill, planing mill, yard, and dock. (1, sawmill; 2, planing mill; 3, power station; 4, office; 5, yard; 6, conveyors.)

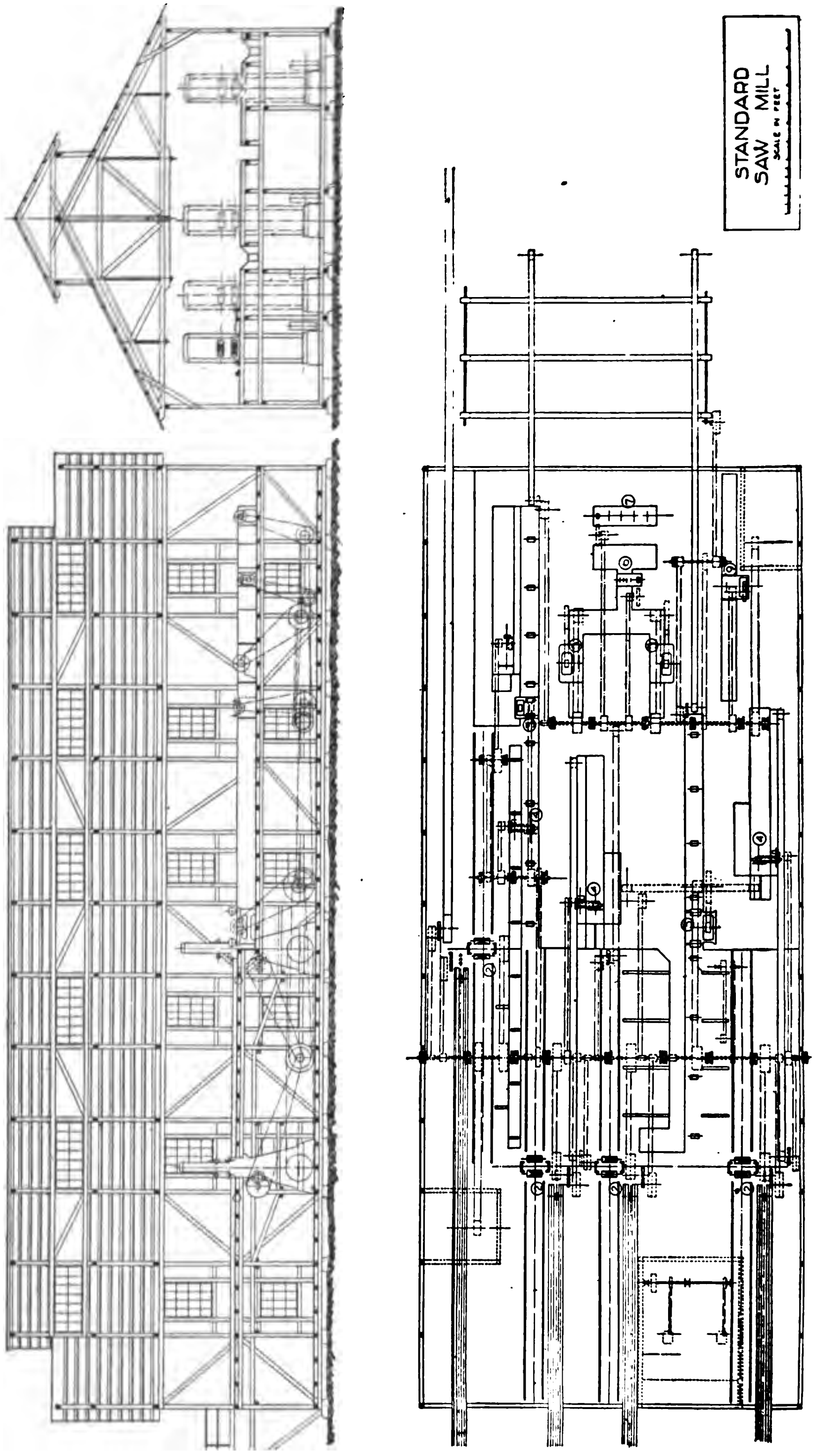

FIG. 22.—Plan of standard sawmill. (1, bull chain; 2, gang saws; 3, edgers; 4, trimmers; 5, resaws; 6, edger for staves; 7, trimmer for staves; 8, filing machine; 9, lath machine.)

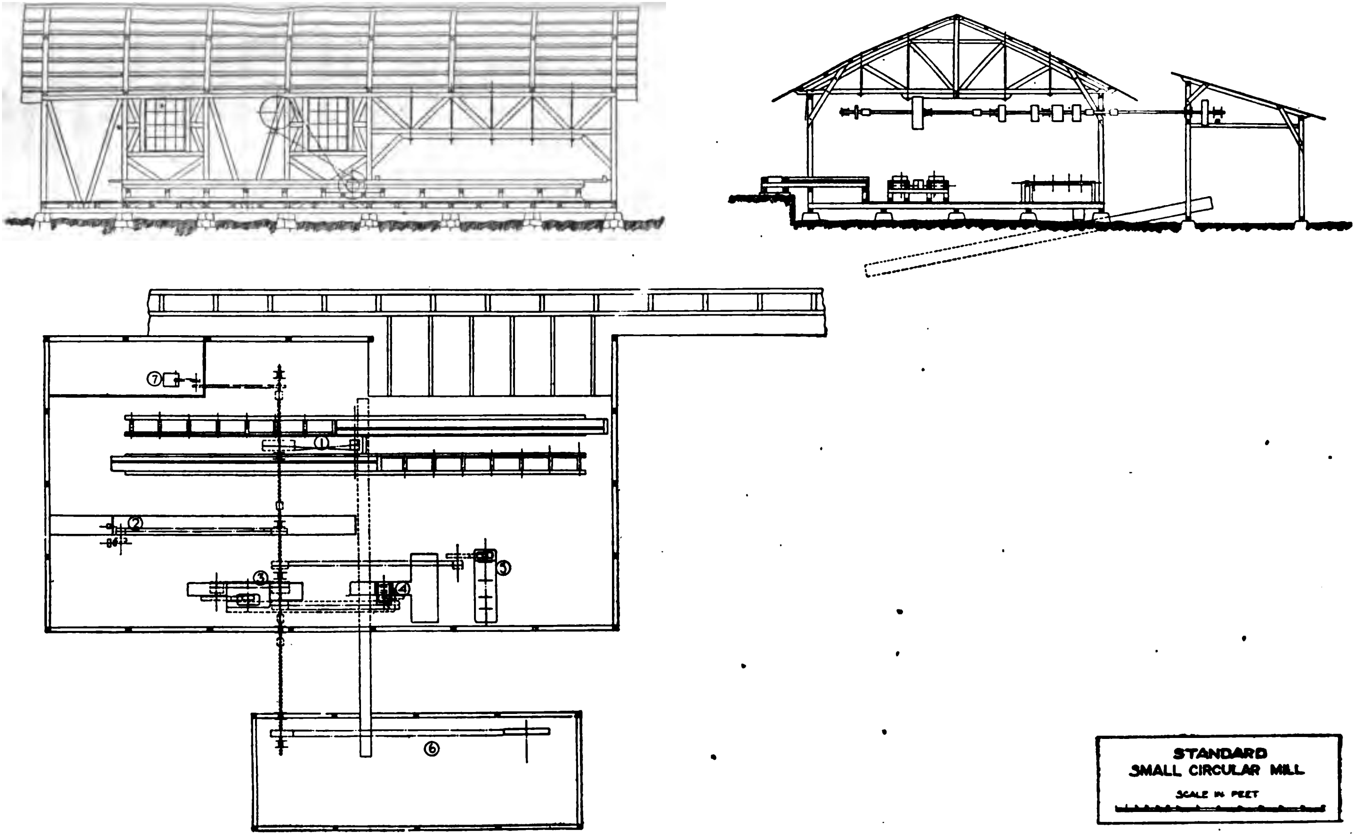

FIG. 23.—Plan of small circular sawmill. (1, double circular head saw; 2, trimmer; 3, Russia; 4, edger; 5, trimmer for staves; 6, portable engine; 7, filing machine.)

STORAGE PONDS.

It is very easy in Norway to find suitable storage ponds for the logs, as all the harbors are sheltered by islands, and along the coast there are thousands of inlets and sounds. Hot ponds, such as used in Sweden, are not necessary in Norway, as the coastal districts have a very mild climate. The logs are sometimes stored on land, by the use of log elevators, but they are usually stored under water, as most of the mills are located on ice-free harbors. The logs are taken to the mill from the pond on a bull chain of similar construction as described in the report on the Swedish lumber industry. The sorting of the logs is usually effected on the one-half inch diameter. A great many mills are careless in regard to the sorting of logs.

SAWMILL EQUIPMENT.

The Norwegian mills are of construction similar to the Swedish mills. A great many improvements in the technic of sawmill operation have been developed in Norway and have passed over to other countries, but the Swedish mills have during the last decades exceeded the Norwegian mills in efficient operation and modern equipment.

There are at the present time hardly more than a dozen up-to-date sawmills in Norway, as the main attention has been paid to the equipment of the planing mills and box factories. In figure 21 a modern Norwegian plant, including sawmill, planing mill, yard, and docks, is shown. In figure 22 a plan of a modern Norwegian sawmill is given. This mill is equipped with four gang saws and other machinery for the manufacture of lumber.

The machinery used in most of the Norwegian mills is of Norwegian make, but a few mills have lately imported Swedish-made machinery. No other foreign machinery is used in the Norwegian sawmills.

The manufacture of sawmill machinery has reached high development in Norway and has materially assisted the Norwegian lumbermen in operating on an economical basis. The sawmill machinery is designed mainly to effect the highest possible saving in raw material, while the matter of speed has been given secondary importance. In this respect the same principle as in Sweden is made the basis of the design of sawmill machinery. It may be mentioned that the principal Norwegian manufacturer of sawmill and planing-mill machinery had an important market in Germany for many years before the war. The better class of German sawmills and planing mills imported Norwegian machines, while the German manufacturers of sawmill and planing-mill machinery exported their products to Italy and other countries where the technic of sawmilling was not so highly developed. It is the belief among some Norwegian sawmill operators that the Swedish sawmill machinery is somewhat superior to the Norwegian machines. On the other hand, the Norwegian planing-mill machinery seems to be better liked than the Swedish-made machinery. Opinions differ, however, a great deal in this respect, and one country may turn out equally good machinery as the other.

The cost (1919) of the principal machinery necessary for the equipment of the saw mill shown in figure 22 is as follows:

4 gang saws	$26,300
4 automatic devices for transportation of logs from pond to mill	4,300
1,300 feet of chains for above	3,200
4 pairs of log carriages equipped with log-handling devices	12,900
1 edger	2,400
1 edger, small size	1,200
3 trimmers	1,200
2 resaws	2,700
1 edger for staves	800
1 trimmer for staves	700
2 filing machines	700
1 resaw for small dimensions	1,000
Conveyors, etc	2,700
Shafting	5,400
Total	65,500

These prices are about 150 per cent higher than the prewar level.

As Norwegian-made machinery of the Jensen & Dahl type resembles the Swedish machines, reference is made to the description of the principal sawmill machinery in the report on Swedish lumber industry.

The majority of the Norwegian mills are steam driven. A few mills are operated by electricity. One of the largest mills in Norway reported in 1918 that a saving of $25,000 had been effected by installing an electric-power plant and selling the refuse to the pulp factories instead of using it for fuel.

SAWING METHODS.

The majority of the Norwegian mills run only one shift, because it has been found that sawing at night is not satisfactory. The supervision of the night operation is very difficult, and the output of the night crew is smaller than that of the day crew. Spruce logs are sawn the year around, but pine is not cut during the summer months, because pine lumber is more likely to stain than spruce.

The sawing systems are similar to those used in Sweden, but in the Norwegian mills the lumber is usually cut with a larger amount of wane. The Norwegian mills claim that it often pays better to cut waney lumber and sell it as fifth grade than to cut practically square-edged lumber and sell it as unsorted or better grades. This depends upon the circumstance that the raw material in Norway is very expensive, and a saving in raw material generally yields a larger profit than cutting with a view to obtaining a larger percentage of the upper grades.

In the Norwegian mills, therefore, quantity is not sacrificed to produce quality. This does not mean, however, that the manufacturing or grading is carelessly done. It must be remembered that the character of the Norwegian logs generally is different from the average run of Swedish logs, which usually contain a larger percentage of clear and upper grades.

Each gang saw is set to cut one dimension of saw logs at a time, based upon the top diameter. For instance, one gang would saw

6-inch logs and another gang 6½-inch, if the logs were sorted on the one-half inch top diameter.

It is customary when sawing logs of 7 inches and more in top diameter to pass the logs through the gang saws twice, turning the log 90 degrees the second time (slabbing the logs). Logs holding less than 7 inches are passed only once through the gang saws. By passing the logs twice through the saws, the mills obtain waney sap boards instead of edgings. This waney stock is mostly sold locally or may be exported in small quantities. Usually saw blades of 17 to 19 Birmingham wire gauge are used.

The sawing schedules always allow an adequate excess in width and thickness to provide for shrinkage. The excess given Norwegian lumber is the same as that for Swedish stock. A detailed schedule of this excess is given in the report on the Swedish lumber industry.

Before a definite sawing system is decided upon the efficiently operated mills generally run a few weeks on trial, keeping an accurate account of the output of lumber and waste of each sawing schedule. In this way they can mathematically determine how to obtain the most suitable stock from their saw logs.

From the gang saws the lumber is passed through the edger. Only one piece of lumber is edged at a time, and care is taken to obtain the widest possible piece and at the same time such dimensions of lumber as will command the highest prices.

The lumber is only roughly trimmed in the mill. Trimming to exact lengths is effected on the dock immediately before shipment is made.

DIMENSIONS.

In the Norwegian mills all lumber for export is cut to English feet and inches. The mills could without difficulty cut to any standards of measurement, but in order to reduce the number of dimensions the English standard is used, because the bulk of the lumber exported is shipped to the United Kingdom. In special cases the mills may undertake to cut lumber according to the metric measurement, but heavy extra charges are made for such stock, and it is rarely done.

The standard dimensions of lumber for export in Norway are about the same as those in Sweden, although the percentage of wide stock (9 inches and wider) is smaller in Norway. The following schedule gives an idea of the different dimensions which most of the standard export mills are prepared to include in their stock lists. Naturally only few mills would carry all these dimensions in stock, as the requirements of the markets change from one year to another. Generally speaking, there are fewer dimensions of spruce than of pine.

Three inches by 11, 10, 9, 8, 7, 6½, 6, and 5½ inches.
Two and one-half inches by 8, 7, 6½, 6, 5½, and 5 inches.
Two inches by 7, 6½, 6, 5½, 5, 4½, 4, 3½, and 3 inches.
One and one-half inches by 11, 10, 9, 8, 7, 6½, 6, 5½, 5, 4½, 4, 3½, and 3 inches.
One and one-fourth inches by 9, 8, 7, 6½, 6, 5½, 5, 4½, 4, 3½, and 3 inches.
One inch by 9, 8, 7, 6½, 6, 5½, 5, 4½, 4, 3½, and 3 inches.
Three-fourths inch by 6½ to 9, 5 to 6, 4½, 4, 3½, and 3 inches.

The Norwegian export statistics do not give any detailed information in regard to the quantities of the various dimensions exported and make no distinction between pine and spruce shipments,

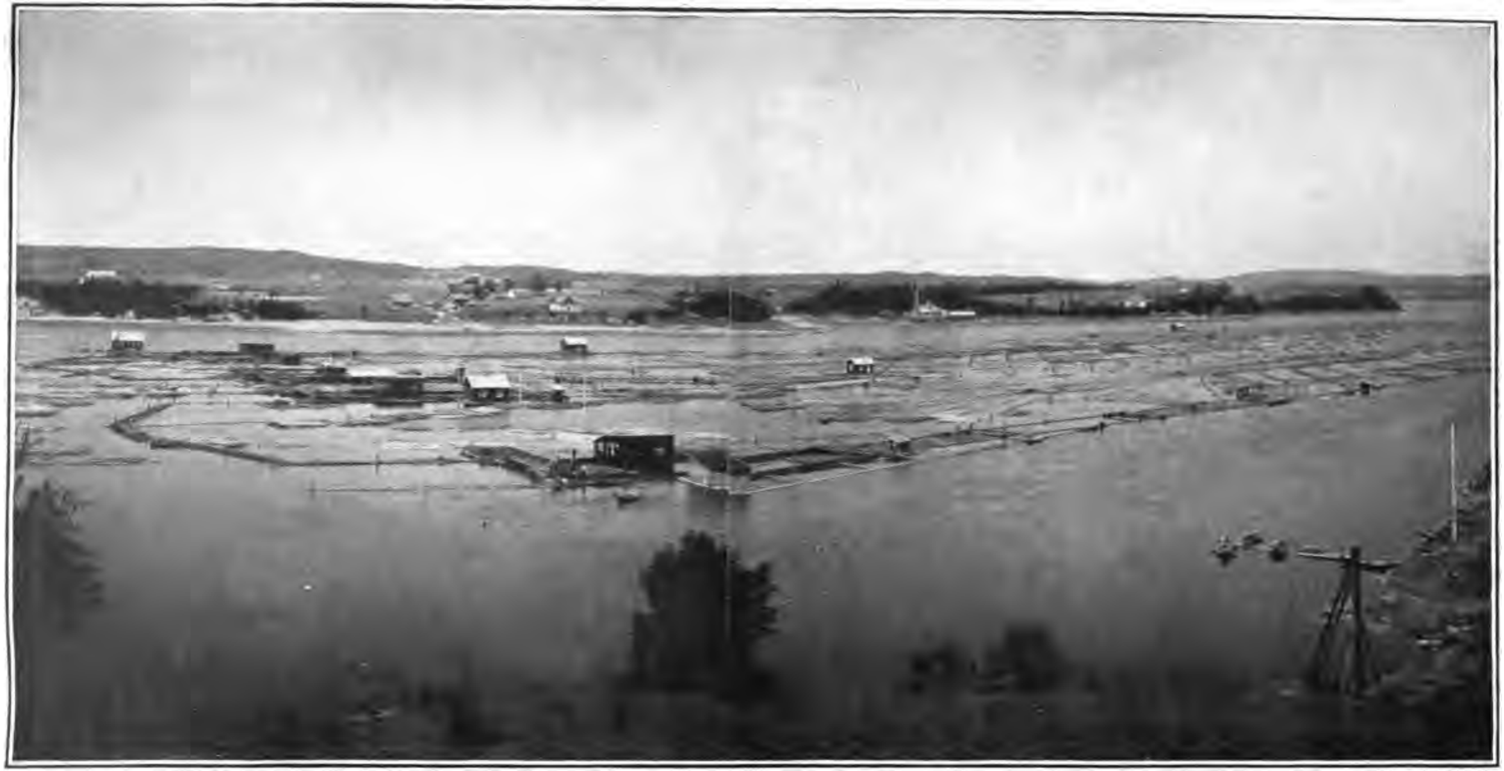

FIG. 24.—SORTING BASIN IN GLOMMEN RIVER AT NES.

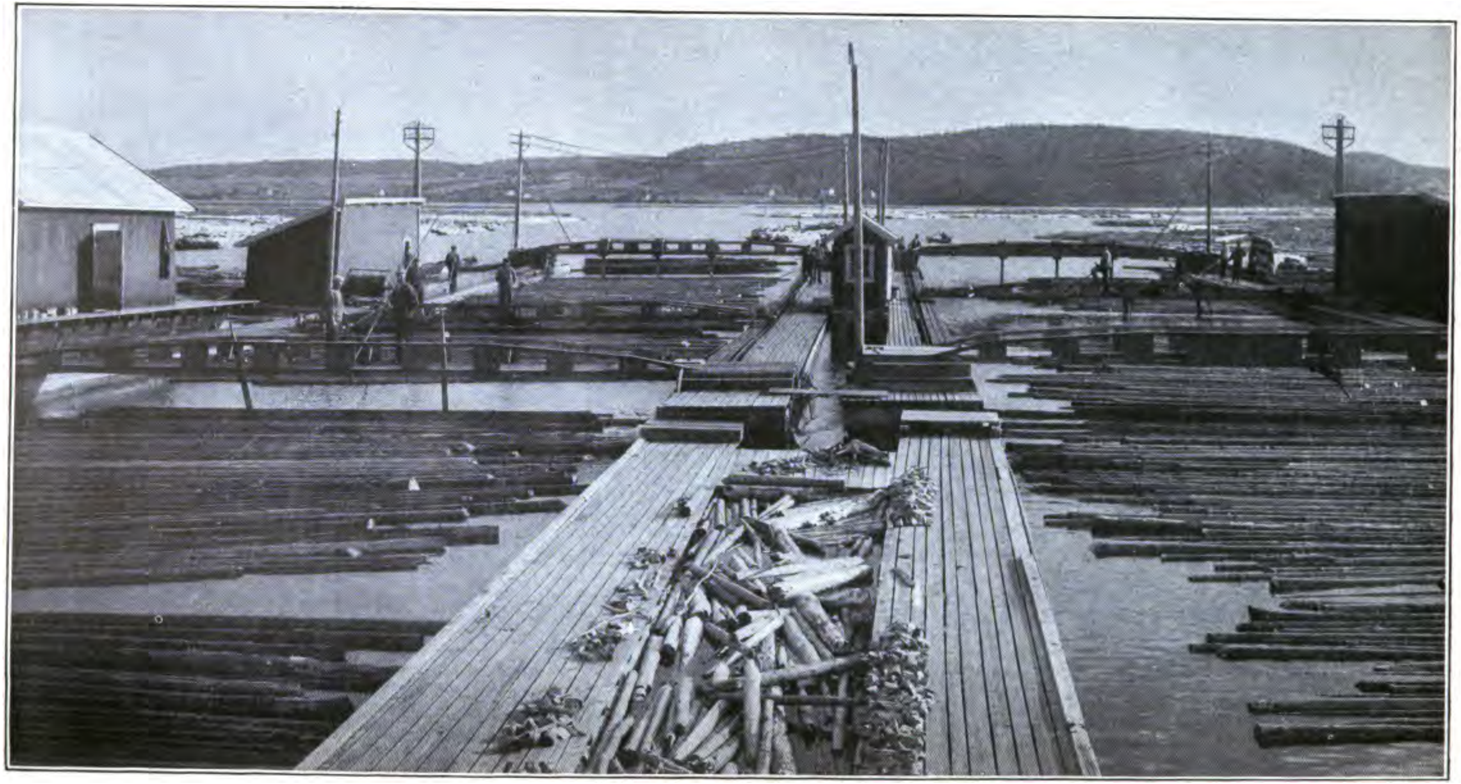

FIG. 25.—MECHANICAL DEVICE FOR BUNCHING LOGS ON THE GLOMMEN RIVER.

so the percentages of the different dimensions can not definitely be ascertained. It appears, however, from an investigation of the shipments effected during a number of years by some of the principal export mills in Norway that the composition of their production generally was as follows: 9 inches and wider, 7 to 16 per cent; 6 to 8 inches, 50 to 60 per cent; 6 inches and less, 30 to 35 per cent. Eleven-inch stock is produced in only small quantities, seldom exceeding 2 to 4 per cent of the total production. Ten-inch stock is not generally desirable, as only a few countries demand this dimension.

The matter of short lengths is no problem in Norway, because the mills rarely sacrifice the lengths of a piece to raise the grade. Furthermore, the contracts for export stipulate that a certain percentage (usually 3 to 5 per cent) of the cargo may contain lumber of 6, 7, and 8 feet. If any excess quantity of short lengths should be produced these quantities can usually be easily disposed of in the local market, where short stock is sold at full price. (In export trade short lumber is sold at two-thirds price.) In Norway the box factories, factories for ready-cut houses, and sash-and-door factories all use short lumber.

During the war a very promising industry sprang up in Norway that utilized short lumber for construction purposes. A company was established for the construction of houses, bridges, etc., in which built-up or laminated beams were used. These beams were generally made in I shape, using long lengths for the upper and lower parts of the beam, while the center of the beam was made up of short pieces of lumber with overlapping joints. The pieces were glued together. Several constructions of this nature were made in Norway during the war and have so far proved to be very satisfactory. Figure 55 shows a cross section of a beam and figure 56 shows the beams used inconstruction of houses. This stock has so far not been exported. (Important experimental work along the same lines has been done by the forest products laboratory of the United States Forest Service, Madison, Wis.)

UTILIZATION OF REFUSE.

Slabs and edgings are generally converted into staves, lath, molding stock, etc. Many mills also manufacture box shooks from sawmill refuse.

Staves are usually cut to the following dimensions: One-half inch by 28 inches by 2, 2½, 3, 3½, 4, 4½, and 5 inches; one-half inch by 17 inches by 3 to 6 inches; three-eighths inch by 33½ inches by 2 to 5 inches; five-sixteenths inch by 18 inches by 2 to 5 inches.

The dimensions of laths are usually 1⅛ by $\frac{3}{16}$ inch and 1 by ¼ inch, with lengths from 2½ up to 4½ feet. Laths are trimmed on the one-half foot.

Refuse too short and narrow to be resawn is either sold as firewood or passed through a machine and cut into chips. This material is sold to the pulp mills. The sawdust is either used as fuel or manufactured into oxalic acid or wood flour. Peculiarly enough, this wood flour and oxalic acid seem to have found their best markets in the United States for many years. The total export of wood flour and oxalic acid and the proportion shipped to the United States during the last few years were as follows:

Years.	Oxalic acid.		Wood flour.	
	Total quantity exported.	Exported to United States.	Total quantity exported.	Exported to United States.
	Metric tons.	*Metric tons.*	*Metric tons.*	*Metric tons.*
1908	324	231	5,122	394
1909	422	336	9,562	2,591
1910	275	209	10,980	3,140
1911	533	445	9,947	3,050
1912	899	662	8,524	1,036
1913	550	466	10,114	(1)
1914	441	327	9,872	(1)
1915	509	107	3,885	2,708
1916	437	172	4,896	3,850
1917	(1)	(1)	2,061	2,055

[1] Not available.

There is very little charcoal made in Norway in connection with the sawmills. The market for charcoal is limited, because the iron ore is usually smelted by electricity.

Some mills in the Trondelagen district and on the southern coast of Norway are not in so favorable position as the mills located on both sides of Christiania Fiord in regard to markets for the sawmill waste. In the latter districts the price paid for sawmill refuse before the war was from 1½ to 1¾ cents per cubic foot, and during 1918 and 1919 it was 4 to 4¾ cents per cubic foot.

There are no refuse burners in Norway, as the profits of the sawmills in many cases depend upon the revenue derived from the sale of the refuse.

PORTABLE AND SMALL SAWMILLS.

Many small sawmills are located in the interior of southeastern and eastern Norway. They are operated by peasants and by lumbermen who contract for the cutting of timber. The smaller holders of timberland in these sections of Norway often have difficulty in getting their logs to the nearest floating river and therefore prefer to erect portable mills in the neighborhood of the regions where they log. These mills are usually located near the railroads, as the lumber must be shipped to the coast by rail. These mills may either be portable or may be constructions of a more permanent character.

Figure 23 shows a plan of the typical small circular mill equipped with the necessary machinery for cutting lumber, staves, etc. The cost (1919) of such a plant is as follows:

1 double circular head saw	$800
1 trimmer	400
1 resaw	1,300
1 edger	800
1 trimmer for staves, etc	1,200
Conveyors	700
Shafting	1,300
Filing machine	300
Total	6,800

Without the machinery for making staves, this plant would cost $2,700.

The usual type of portable mill cuts from 350 to 400 logs in 10 hours and is equipped with an engine of 8 to 10 horsepower. Some of these small mills operate planers. The waste is generally heavy and the market for it is usually limited. Circular saws are used. The saw blade has a conical shape, being thinner at the edge than at the center. The manufacture is often very unsatisfactory, as the circular head saws never can turn out stock equal to that cut by gang saws.

The usual sizes of planks and battens produced by these mills are 3½, 3, 2½, and 2 inches in thickness and 5½, 6, 6½, 7, 7½, 8, 8½, 9, and 11 inches in width. This stock is very waney and is usually sold to the planing mills and not exported as sawn stock. It is roughly graded and is not trimmed. The average lengths are short, generally 14 to 16 feet.

SELLING OF LUMBER FROM SMALL MILLS.

Stock from the small mills, when sold to the planing mills, is purchased on a basis of third grade. Better grades are seldom produced. The grading rules take the amount of wane into consideration. Third-grade stock may have a maximum wane on two edges totaling one-third of the width of the piece. For instance, 9-inch stock is required to have a sawn surface of at least 6 inches. Stock of fourth grade must have a sawn surface at least five-eighths of the width of the piece, and fifth grade a sawn surface of one-half of the piece. As the stock is not trimmed, the length is only measured up to the point where the wane attains its maximum size according to the above rules. The purchasers will therefore always obtain an excess in length for which they do not pay. This excess waney part of the stock is not wasted at the mill, but carefully utilized for box shooks or resawn for planed stock. The small mill operators, however, are gradually learning to cut their stock in such a wav that they obtain payment for almost the entire piece.

Standard contracts covering the purchase of such stock have been established by the Norwegian Lumber Export Association, but the different mills compete in regard to prices. On the other hand, the small sawmill operators have organized very strongly in order to maintain the prices. The schedule upon which such stock is purchased is as follows:

The basis of prices is 2½ by 6½ inch third-grade stock. Stock 9 and 11 inches in width commands 10 per cent higher prices than basis (pine and spruce). Six-inch spruce stock is sold at 5 per cent less than basis, and pine stock 6 inches wide at 7½ per cent less than basis; spruce stock 5½ inches wide at 10 per cent, and pine stock 5½ inches wide at 12 per cent less than basis.

If third, fourth, and fifth grades are taken "log run," the following schedule applies: Fourth grade, 12½ per cent less than third grade: fifth grade, 25 per cent less than third grade.

Stock 2 inches thick is covered by special stipulations. The basis for this stock is fourth grade, allowing a wane not exceeding two-thirds of the thickness of the piece. Fifth-grade stock must show a sawn surface on all four sides, and the wane is naturally very large. Fifth grade of 2-inch stock is sold at 25 per cent less than the basis, which is fourth grade.

Short lengths of 6, 7, and 8 feet are sold at two-thirds price.

MARKETING OF WANEY STOCK.

Average prices of waney stock from the small mills, delivered at the principal southeastern ports of Norway, are shown in the following statement. The quotations are in United States currency per thousand board feet, and are based on 2½ by 6½ pine stock (spruce generally $1.23 per thousand feet lower than pine).

1902	$15.81	1911	$19.30
1903	16.08	1912	21.98
1904	13.40	1913	22.11
1905	13.94	1914	23.05
1906	15.54	1915	23.72
1907	16.62	1916	32.43
1908	15.81	1917	48.78
1909	16.08	1918	55.48
1910	19.03	1919	59.50

In regard to the grading of waney stock sold to the planing mills in Norway, an agreement has recently been entered into by the manufacturers of this stock and the planing mills in eastern Norway whereby this stock will be graded and inspected by a special inspection service. The members of the local associations of smaller sawmill operators now sell through a sales corporation that handles the total output of the members. This is no doubt a very important step, as it will tend to standardize the output of the small mills. This inspection will only apply to the dealings between the small mills and the standard saw and planing mills in Norway.

Although waney stock as raw material for planed lumber and box shooks may be more expensive than lumber cut from saw logs by the export mills, there are other advantages in connection with the purchasing of waney stock which must be taken into consideration.

The planing mills purchasing this stock have their own inspectors to pass on each car before it is shipped and know what they receive. The rough lumber can be turned into planed lumber within a short time after its arrival at the planing mills, and the loss of interest on the raw material is thus very small. In the case of saw logs, the mills often have their money tied up one or two years and take the chance of having the logs discolor or sink during the process of floating.

The waney stock of planks and battens is not usually shipped abroad. During the war, however, the scarcity of lumber in western Europe gave this stock a ready market in those countries, and it was sold at prices only slightly below those of the regular stock. When the armistice was signed, however, the demand for waney stock decreased suddenly, and a great many speculators in Norway found themselves with large quantities of this material on hand, for which they were offered a rebate of $15 to $17 per thousand feet, which caused them heavy losses. It is not believed that this stock will be exported in the future, as it is poorly sawn and miscuts are frequently found.

SEASONING.

The yards in Norway are much smaller than the yards in Sweden and Finland, as there is no necessity of keeping large stocks on hand, because all the export mills in Norway can ship the year around. It is, furthermore, difficult in many sections of Norway to find adequate yard space on account of the topographical conditions of the country. The Norwegian mills are generally not so careful in the seasoning of their lumber as the Swedish mills, and the yards are therefore not so well kept.

Most of the lumber yards are equipped with a rail system, but so far as could be learned there are practically no mechanical devices in Norway for piling lumber. Only one mill visited had a system of conveyors whereby the lumber was transported automatically from the mill to the yard. The lumber is usually transported to the yards on trucks pulled by horses and is piled by hand. The piles are generally from 15 to 20 feet high.

The piling system prevailing in Norway is edge piling, which affords a quicker way of drying lumber than by piling it with the face side up. Edge-piled lumber, however, is more liable to split and check unless careful inspection is exercised. When the lumber is sufficiently dry it may be repiled solidly in order to economize space. The piling systems are otherwise about the same as described in the report on the Swedish lumber industry. While in Sweden the bases of the piles in the better yards are exceptionally high, in Norway the lumbermen are more careless in this respect and make very low bases.

As most of the lumber in Norway is run through planers, a slight discoloration does not cause any considerable trouble, because the discoloration generally disappears during the planing process.

Lumber in Norway requires from two months to six months to dry. There are only a few dry kilns, operated in connection with planing mills and box factories, and rough lumber for export is always air dried. It is generally believed that the value of the refuse is too high to permit its use for kiln drying of lumber to any great extent.

PLANING MILLS.

The planing-mill industry in Norway has reached a higher degree of development than in the other European countries. The first planing mill was constructed in 1863, and the industry has developed very rapidly while the sawmill industry has decreased.

Most of the larger Norwegian planing mills are operated in connection with box factories, so that the operations may easily be changed from the manufacture of floorings, ceilings, etc., into the manufacture of box shooks and vice versa to follow the markets and their requirements.

Some planing mills also operate sawmills and obtain their lumber from logs, while others purchase sawn lumber. The most efficiently operated planing mills secure their material from logs cut to special dimensions for the planing mill and also purchase waney stock from other mills as described previously.

The largest plant in Norway has an annual production of 24,000,000 board feet of planed lumber and 16,000,000 feet of box shooks.

EQUIPMENT OF MILLS.

The Norwegian planing mills generally offer a contrast to the sawmills by being very well equipped with modern machinery. The

Norwegian planing-mill products are therefore superior to the sawn lumber. The plan of a modern planing mill is shown in figure 26.

Nearly all the Norwegian planing mills are equipped with the Jensen & Dahl type of planers and planing-mill machinery, manufactured in Norway. These machines have been closely adapted to Norwegian conditions, and as the raw material became expensive and scarce these machines have been improved to effect the highest possible saving in material and at the same time turn out well-manufactured lumber.

The planing mills are generally equipped with trimmers, resaws, edgers, and planers as shown from the above plan. The cost (1919) of the machines necessary for the plant illustrated is as follows:

4 planers	$28,100
3 resaws	8,700
2 edgers	2,400
4 trimmers	1,600
Conveyors	4,000
Shafting	4,000
Filing machines	2,000
Total	50,800

These prices are 150 per cent higher than the prewar prices.

The Norwegian planers have many excellent features. They are made in several sizes, the largest operating at a maximum speed of 260 linear feet per minute. The planers have a system of fixed knives and rotary cutters combined, similar to the Swedish planers, the only difference being that the Norwegian planers have several fixed knife drawers which can be operated independently of each other, while the Swedish planers have two or three knives set in one drawer. The patent side cutters are constructed in a way similar to that described in the report on the Swedish lumber industry.

The chief advantages of these machines seem to be reliability in operation, saving in raw material, perfect manufacture, and the short time required for the changing of steel.

In order to effect the closest possible utilization of the waste material, the shavings or ribbons produced by the fixed knife drawers are passed through a machine and converted into excelsior. This machine consists of two rows of steel disks revolving against each other which cut the shavings into threads. The machine produces about 1,000 pounds of excelsior in 10 hours, the disks making about 160 revolutions per minute. For driving the machine 1½ horsepower is required. The cutter chips are either used for fuel or as raw material for the pulp factories.

The other machinery, trimmers, resaws, edgers, etc., are of the same types as used in Sweden.

RESAWING OF ROUGH STOCK.

The lumber used in the planing mills is nearly always special stock cut in the sawmill or purchased from portable mills. It consists of very waney planks and battens, because such stock can be cut, resawn, and planed with the least possible waste.

The lumber is dried somewhat longer than the ordinary rough stock for export and contains about 25 per cent moisture. From the yard the rough lumber is taken to the planing mill, where it is

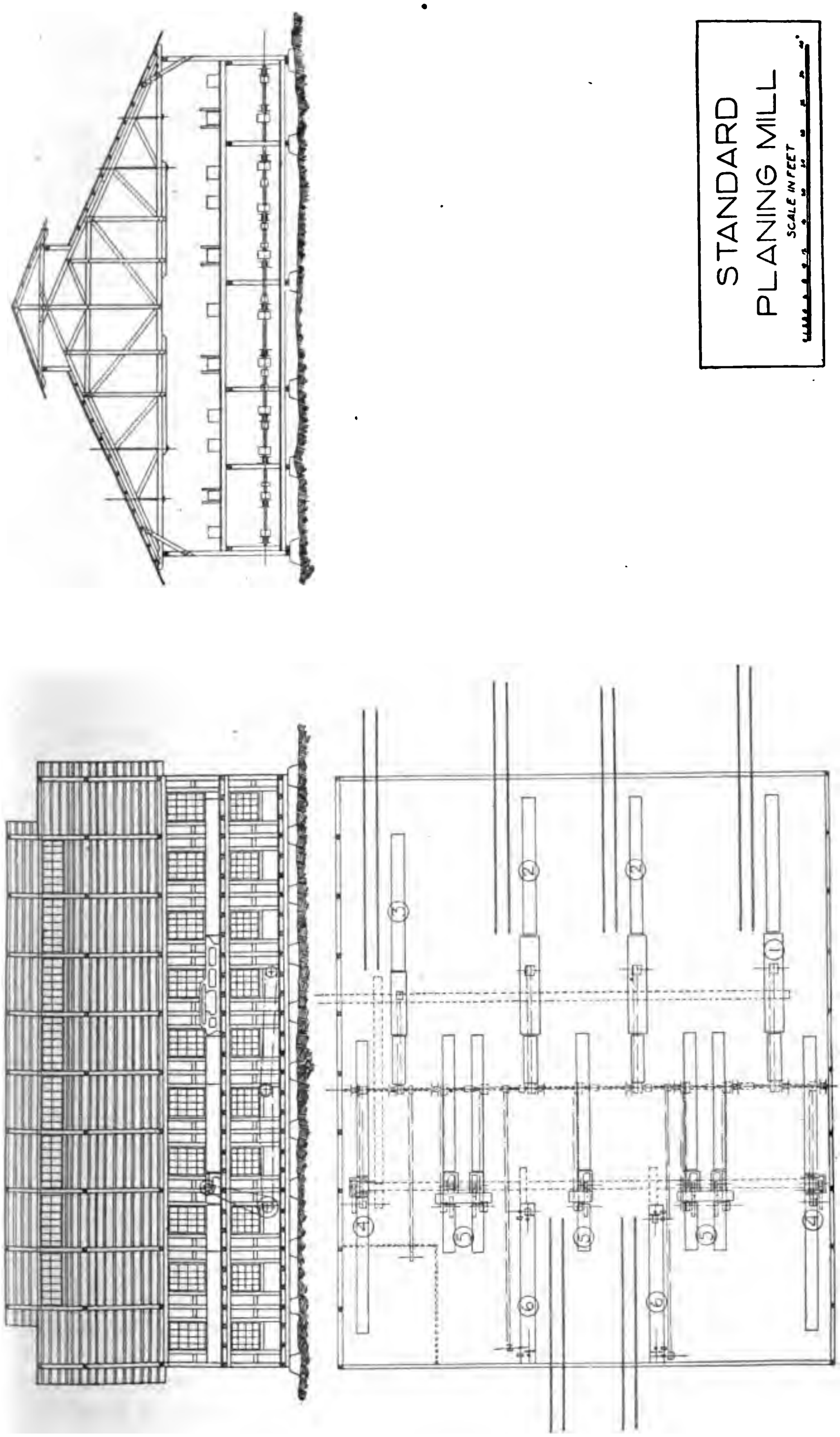

FIG. 26.—Plan of standard planing mill. (1, 2, and 3, planers; 4, edger; 5, resaw; 6, trimmers.)

trimmed. After this process the waney stock is passed through either single or double resaws. The resaw blades may be as thin as 22 Birmingham wire gauge, whereby the saw kerf is reduced to 0.058 inch. These circular saws are of a conical shape, being thinner at the edge than at the center.

Some mills have worked out a system of resawing which reduces the waste to a minimum. In order to effect the closest possible utilization of material many planing mills in Norway resaw their stock on millimeter measurements. It should be noted, however, that in order to obtain these results the lumber must be very close-grained and have a solid texture. Coarse-grained lumber can not be resawn in this manner.

The following schedule gives an idea of the close utilization of raw material:

Thickness of rough stock.	Pieces of resawn stock.	Nominal thickness.[1]	Thickness of rough stock.	Pieces of resawn stock.	Nominal thickness.[1]
		Inch.			*Inch.*
4 inches	3	5/8	2 inches	3	1/2
	3	3/4		1	3/4
3 inches	4	5/8	2 inches	3	3/4
	1	3/4	2 inches	3	1/2
2½ inches	3	5/8		1	5/8
	1	3/4	2 inches	2	3/4
2½ inches	3	7/8		1	5/8
2½ inches	2	1	1 inch	1	1/2
	1	5/8		1	5/8

---

[1] By nominal measurement of thickness is meant the thickness on which the planed boards are sold. The actual measurements of the boards when planed would be one-eighth inch less. For instance, five-eighth inch nominal measure would be one-half inch actual measure.

The above schedule represents resawing of regular stock sizes from the sawmill yard. A great many mills, however, cut special stock for the planing mills, and the following schedule gives some of the principal dimensions of this nature cut in Norway:

Thickness of rough stock.	Pieces of resawn stock.	Nominal thickness.	Thickness of rough stock.	Pieces of resawn stock.	Nominal thickness.
		Inches.			*Inches.*
2 15/16 inches	2	1½	1 15/16 inches	4	½
2⅞ inches	5	⅝		or 2	1
	or 2	1½	1⅞ inches	2	1
2 7/16 inches	2	1¼		or 1	1¼
	or 4	⅝		and 1	¾
2⅜ inches	2	1¼		or 4	½
2⅛ inches	3	¾	1¾ inches	3	⅝
				or 2	1

The first condition for employing such exceedingly fine resawing methods is that the raw material hold the required dimensions and that it is accurately cut. Every fraction of an inch is taken into consideration when the purchases of waney stock are made.

Considering the fact that a large percentage of Norwegian rough lumber is imported by other countries for planing purposes and that the importing countries frequently employ the same methods of resawing as are used in Norway, it is easily seen that it is of the greatest importance to the importers to receive Norwegian rough

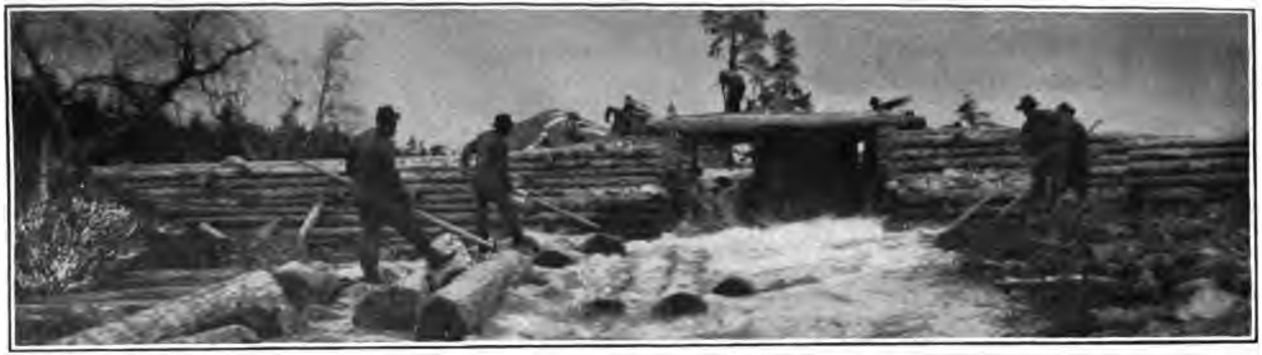

FIG. 27.—FLOATING OPERATIONS.

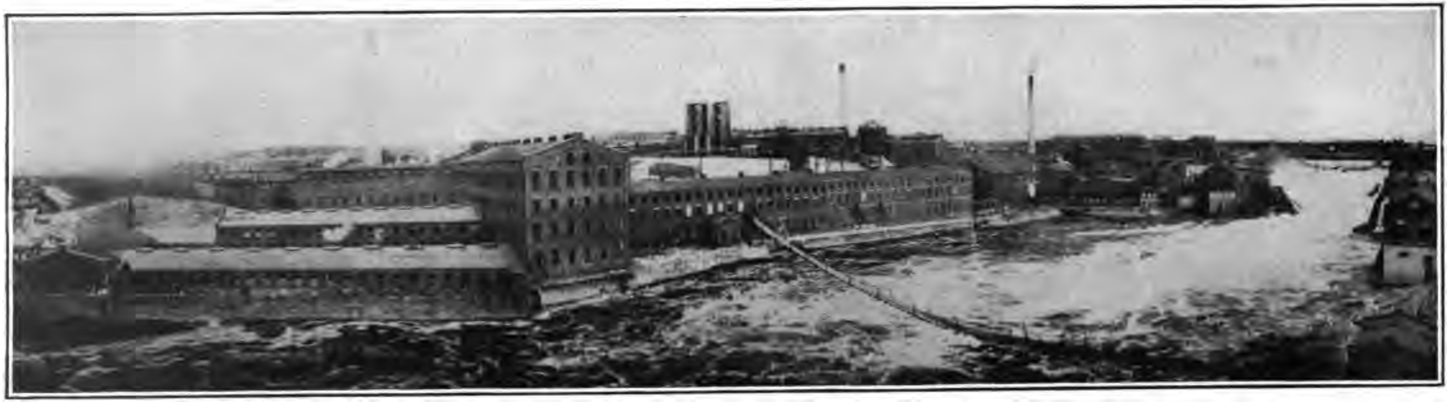

FIG. 28.—PAPER AND PULP FACTORY IN NORWAY.

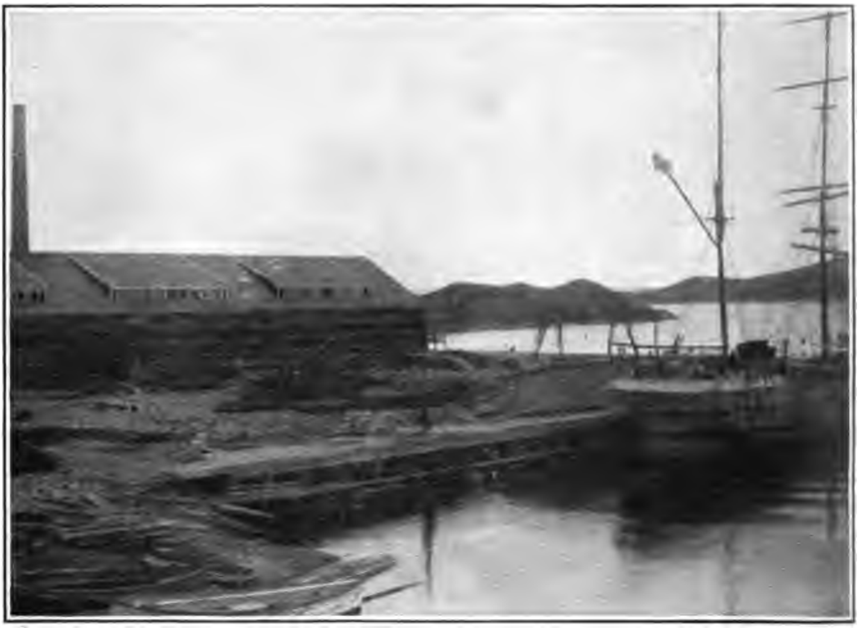

FIG. 29.—VENEER FACTORY.

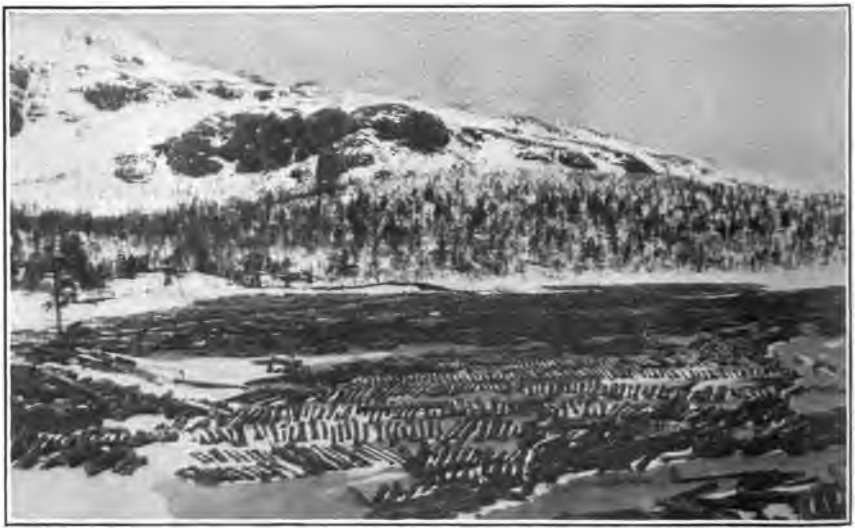

FIG. 30.—LOGS PILED ON THE ICE READY FOR FLOATING.

lumber well manufactured, especially when one takes into consideration that heavy charges for freight, custom duties, etc., are added to the cost of the material.

The resawing schedules given above may seem unsatisfactory to many mills, because in some cases the planed lumber produced may be somewhat scant. All of the above schedules are not in general use in Norway. It depends upon the markets and the customers of each mill to what extent they can employ the schedules. For instance, to cut three thicknesses of three-fourths inch stock from one batten 2 inches thick would in the majority of cases be considered inadvisable.

It is claimed that the planed lumber resawn from rough stock has frequently been sent to the London market on consignment. In this market the lumber is sold at auction sales, and as the purchasers have an opportunity of inspecting the lumber before the purchase is made no claims are afterwards considered, but the prices for such scant stock are usually correspondingly low. The practice of shipping on consignment is discouraged in Norway.

In regard to the planed lumber, it it generally required that the upper cutters must touch the back of each board. Otherwise the lumber is considered scant. If the lumber through some faulty resawing turns out scant, it is dressed down to the next size in preference to having it shipped along with other stock holding the required sizes. There is no provision in the Norwegian grading rules to the effect that the lower grades may be shipped scant. Cull stock, as well as first grade, must always hold the required measurements according to the grading rules. It may be said that the saving in raw material is larger in resawing narrow widths than wide stock.

ECONOMIES IN RESAWING.

The following example shows the result of the resawing of a waney batten 2½ by 7 inches: 1 piece ⅞ by 7 inches; 1 piece ⅞ by 6½ or 6 inches; 1 piece ⅞ by 5 inches. If the batten were square-edged, the width of all three resawn pieces would have been 5 inches. In this case it is seen that considerable material has been saved by resawing the waney stock.

Figures 53 and 54 show two cross sections of waney stock illustrating the resawing systems. Section A shows the waste of material incurred by edging the waney stock before it is resawn, and section B shows the closer utilization by edging the stock after the resawing has been effected. The advantage of the latter resawing system is not only apparent by the actual saving in cubic contents of raw material, but also in the higher value of the wider stock produced, as the price of planed lumber for export is regulated according to the width. The narrowest board of the waney resawn stock must generally be edged before it is run through the planer.

If the rough stock has been carefully resawn and holds the required dimensions, it is not necessary to operate both upper and under cutters, but only the upper cutter on the back of the board and the fixed knives on the face side may be used, provided that the sawn surface is smooth. The planer is operated by three men, one feeding the machine, one attending to its operation, and the third man taking care of the planed boards at the tail end of the machine.

By the planing of rough stock the average length is increased, many firms figuring an increase of 1 foot, because if the lumber were not planed the wane would cause a larger waste of mill ends.

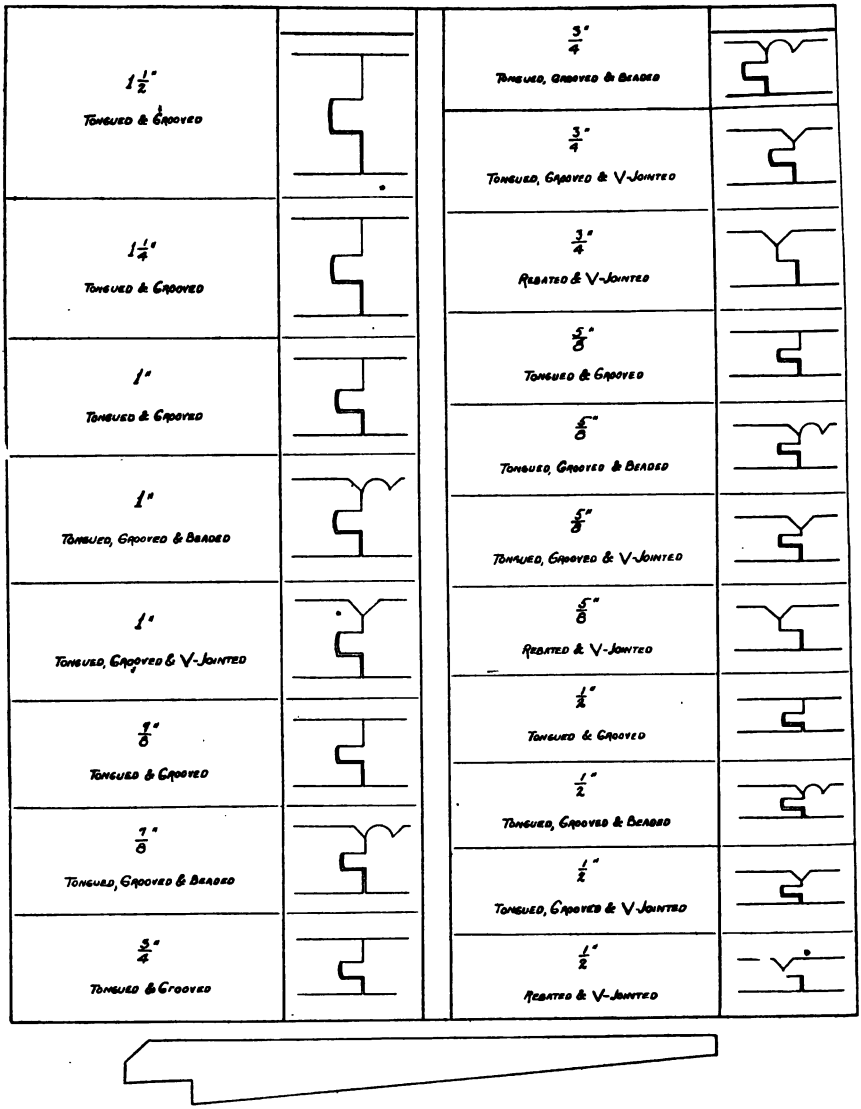

FIG. 31.—Standard profiles adopted by exporters in Norway, Sweden, and Finland.

Furthermore, when discolored lumber is run through the planer the discoloration often disappears, thereby raising the grade.

It should be remembered that the planed lumber is sold on the basis of the rough sizes less one-fourth of an inch in width and one-eighth of an inch in thickness, allowed for the waste in planing.

For instance, 1 by 4 inch planed stock would hold ⅞ by 3¾ inches actual measurement. As the technic of resawing and planing in Norway is very highly developed, the mills do not require this allowance of one-eighth inch and one-fourth inch, and their main profit represents this saving in raw material, as the total waste for resawing and planing would hardly exceed one-fourteenth to one-sixteenth of an inch in most cases.

There is no necessity for passing the planed boards through a sanding machine, as the surface of the planed lumber is so perfectly smooth that it has the appearance of glass, and the fixed knives cut through the knots without chipping the grain. By using the patent cutters the cutter marks are 50 per cent smaller than when using ordinary cutters.

Norwegian pine and spruce are very well suited for planing, because the texture of the wood is very solid, and were it not for the many knots, these species would be ideal raw material for planing.

Planed lumber is produced in a variety of dimensions ranging from 4 to 11 inches in width and from one-half inch up to 1½ inches in thickness. The principal dimensions and profiles produced by nearly all the export mills in Norway are seen in figure 31. These sizes and shapes have been made standard through the efforts of the Norwegian Lumber Export Association, and are also adhered to by the other northern European mills.

MISCELLANEOUS PRODUCTS.

Some planing mills also manufacture moldings. There are a great many different patterns and usually considerable trouble is experienced in filling orders for this stock, but it is claimed by the mills making a specialty of moldings that the profit realized is very satisfactory.

In connection with planing mills other woodworking establishments are at times operated, such as sash and door factories, bobbin factories, etc. The total value of the exports of some of the principal articles of this kind made of Norwegian wood were as follows:

Articles.	1913	1916	Articles.	1913	1916
Moldings	$38,000	$52,000	Clothespins	$67,000	$21,000
Sash and doors, etc	9,000	11,000	Skis	19,000	9,000
Cooperage	117,000	196,000	Various articles (washing boards, wooden pegs, etc.)	88,000	228,000
Bobbins	49,000	8,000			

BOX FACTORIES.

The making of box shooks has reached its highest development in Norway and seems to have better prospects there than in the other northern European countries. The war caused an increased ouput of box shooks in Norway.

While the export statistics give the average value of rough lumber for export in 1917 as $46.10 per thousand feet, the corresponding values for planed lumber and box shooks are given as $55.75 and $69.45.

Considering the nature of the saw logs in Norway and the high value of the raw material, it is easily understood that box-shook manufacture is especially advantageous, because even the smallest logs can be utilized for box material, besides a large percentage of the sawmill waste, such as slabs, mill ends, etc.

The box factories are generally operated in connection with the planing mills, whereby the production can be easily changed according to the market conditions without discharging the crew. Fredrikstad, in southeastern Norway, is the principal center for the manufacture of box shooks. This industry is chiefly based on export trade.

A number of special machines, constructed with a view to effecting the highest possible saving in raw material, are used in the box factories. Many mills have made improvements on the ordinary box machinery, but very few, if any, automatic box machines are in use in Norway.

The raw material is rough lumber cut to special sizes and mill ends, slabs, and other sawmill waste. During normal times considerable quantities of split wood (mill ends) were imported from Sweden, Finland, and Russia by the Norwegian box factories. This material was carefully resawn, edged, and trimmed. Large quantities of shooks are planed.

DIMENSIONS OF BOX SHOOKS.

There are very few standard dimensions for box shooks. Even some of the largest importers abroad do not seem to understand the advantage of standardizing their shook specifications. The mills in Norway are, therefore, generally unable to keep shooks in stock, but must make them according to orders.

The prices vary materially in each case, depending upon specifications. It is always a matter of discussion whether the box ends, tops, and sides shall be made up of one, two, three, or more pieces, and this circumstance materially influences the price, as the supply of wide dimensions in Norway is limited and the prices for such stock are high.

The following specifications may serve as an example of a few of the standard boxes turned out by the Norwegian box factories:

		Dimensions.
Pyramid butter box:[1]		
	2 ends	12 inches base, 11 inches top, 13 inches long, 9/16 inch thick.
	2 sides	13⅛ inches base, 12⅛ inches top, 13 inches long, 9/16 inch thick.
	1 top	12⅛ by 12⅛ by 9/16 inch.
	1 bottom	13⅛ by 13⅛ by 9/16 inch.
Soap boxes:		
I	2 ends	13⅜ by 8¾ by ⅜ inch.
	2 sides	18¾ by 8¾ by ⅜ inch.
	1 top	18⅜ by 13⅛ by 5/16 inch.
	1 bottom	18⅜ by 13¾ by 5/16 inch.
II	2 ends	15½ by 6⅞ by ⅜ inch (planed on one side).
	2 sides	20⅛ by 6⅞ by 5/16 inch (planed on one side).
	1 top	20 by 15¼ by 5/16 inch (rough).
	1 bottom	20 by 15⅞ by 5/16 inch (rough).
Salt boxes:		
	2 sides	14⅝ by 13¼ by 5/16 inch (made up from 3 and 4 inch shooks).
	2 ends	13¼ by 13¼ by 5/16 inch (made up from 3 and 4 inch shooks).
	1 top and 1 bottom	13⅞ by 13⅞ by 5/16 inch (made up from 3 and 4 inch shooks).
	4 braces	13¼ by 2 by ⅜ inch.

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[1] Shooks to be planed on both sides and edges; measurements refer to planed stock; minimum width of any shook, 2⅜ inches.

The shooks are bundled when ready for shipment and tied with wire or string. This work is done by hand, as no shook-tying machines have been put on the market in northern Europe so far.

Many importers require the shooks to be branded with a manufacturer's trade-mark. For this purpose American or English machines that effect the branding in one or several colors are in use.

It is impossible to give any definite information in regard to the prices of box shooks, as the prices are quoted per box or per 1,000 shooks and special stipulations govern each specification.

The official statistics do not make any distinction between rough and planed shooks or state whether of pine, spruce, or broad-leafed species. It is believed that the quantities of shooks manufactured from hardwoods are negligible.

Spruce is preferable for food containers, as this wood has no taste or smell. Pine is used for all purposes where the resin does not interfere with the usefulness of such stock. Both pine and spruce are excellent box materials, as shooks made from both of these species hold nails well and do not warp or split. The knots are generally small and firmly incased in the wood.

PULP AND PAPER INDUSTRIES.

There are no recent statistics showing the production of pulp and paper, but as the pulp and paper industries are largely based on export, the figures of the exportation of these commodities show the growth of these industries.

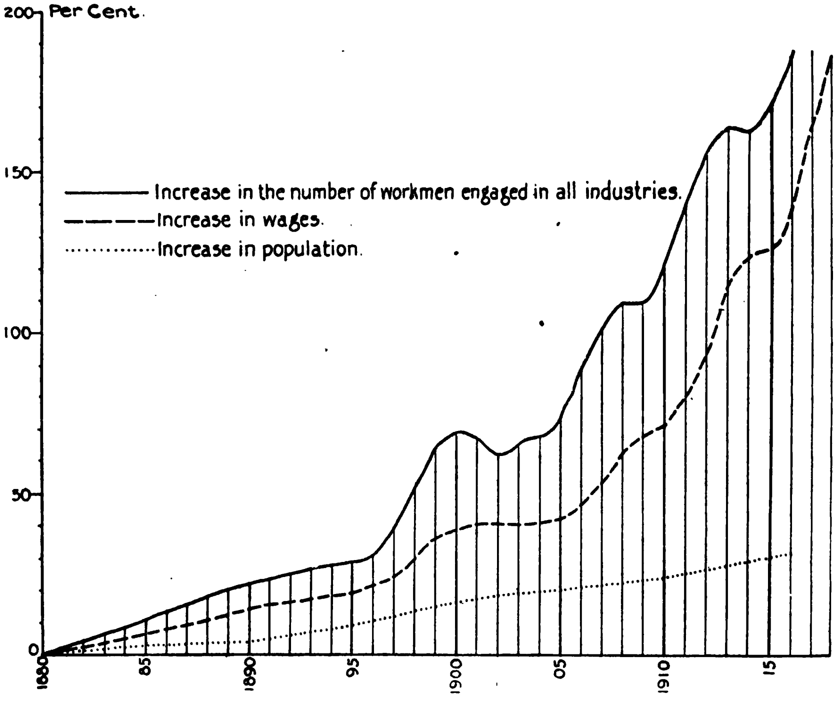
In the following table the exports of pulp and paper are given in connection with exports of lumber and timber, and the decreasing importance of the lumber industry is clearly indicated.

Years.	Lumber and timber, all kinds.	Wood pulp and cellulose.	Paper, cardboard, etc.
	Cubic feet.	*Metric tons.*	*Metric tons.*
1830-1835, average	26,500,000	....	....
1836-1840, average	33,100,000	....	....
1841-1845, average	36,500,000	....	....
1846-1850, average	36,800,000	....	....
1851-1855, average	48,000,000	....	....
1856-1860, average	54,100,000	....	....
1861-1865, average	64,100,000	....	....
1866-1870, average	74,600,000	114	6
1871-1875, average	82,100,000	4,605	110
1876-1880, average	60,600,000	18,644	976
1881-1885, average	66,800,000	67,909	3,262
1886-1890, average	65,000,000	152,178	5,015
1891-1895, average	62,300,000	222,658	18,642
1896-1900, average	69,100,000	328,547	41,010
1901-1905, average	66,800,000	433,129	55,966
1906	71,000,000	505,627	92,114
1907	66,400,000	556,605	98,939
1908	52,400,000	594,615	112,385
1909	46,600,000	601,875	128,772
1910	43,900,000	635,800	143,299
1911	41,600,000	621,087	131,560
1912	38,400,000	693,591	156,046
1913	36,500,000	706,919	186,416
1914	33,100,000	638,146	188,217
1915	48,100,000	734,085	214,115
1916	48,400,000	690,824	205,384
1917	....	404,151	84,073
1918	....	483,461	116,723

The development of the wood-using industries in Norway is likely to follow the same trend as shown in the preceding table. As the stumpage values increase it will be necessary to export wood products manufactured to the greatest possible extent.

LABOR.

During the last 10 or 15 years all industries in Norway have developed very rapidly. In 1905 there were 3,700 factories, employing 86,500 hands, and at that time the total population was 2,315,000.



Courtesy Norwegian Employers Ass'n.

FIG. 32.—Relation of wages to employment and population since 1880.

At the beginning of the war there were 6,900 factories, employing 147,000 hands, when the population was 2,487,000. The number of persons engaged in industries had thus increased about 70 per cent since 1905, while the population of Norway increased only slightly more than 7 per cent.

A great many of these industries have been able to offer both better wages and working conditions than the sawmills and planing mills, and as a consequence the lumber mills have experienced serious difficulties during late years on account of scarcity of labor and increased wages.

While before the war the cost of labor in Norway was one of the lowest in Europe, Norway to-day is paying higher wages than most of the other European countries. In addition to the high wages the efficiency of the Norwegian laborers, as a whole, has seriously decreased during the last few years, mainly as a result of the abnormal conditions prevailing during the war.

Figure 32 shows the relation between the increase in wages, number of hands engaged in industries, and population, with 1880 as a starting point. (Diagram through the courtesy of the Norwegian Employers' Association.)

In many ports in Norway $10 to $15 per working day, including overtime, was often paid for stevedoring, and it may be said that the war to a great extent has spoiled the labor market. The men often worked only a few days and laid off the rest of the week, and the tendency was for the laborers to look for jobs lasting a short time in preference to obtaining continuous work in the mills. The reliable stock of Norwegian saw and planing mill workmen is disappearing and the mills are often forced to employ untrained men, which necessarily must influence the cost of production and the quality of the products turned out.

It is evident to anyone conversant with conditions in other industrial countries that the Norwegian workmen, as a whole, are inefficient at the present time and that the Norwegian lumber industries will not without difficulty be able to compete with the corresponding industries in other countries, unless the Norwegian laborers should adopt their prewar working standard.

The sawmill laborers have for years received smaller wages than given by most of the other industries in Norway; but it must be taken into consideration that the Norwegian sawmill and planing-mill industries have for a long time been passing through very difficult economical conditions.

Only in a very few cases have the Norwegian mill owners built homes for their men, but this may be the result of the unsatisfactory financial returns of the lumber business in prewar days and the limited capital with which most of the mills were operating. Furthermore, most of the mills in Norway are located in densely populated districts where adequate dwellings generally have been easily obtainable.

The employers are required by law to insure their men against accidents, and there are also very strict regulations in regard to the employment of women and children. Women are not, as a rule, employed in the Norwegian saw and planing mills.

The increase in wages during the war has not benefited the Norwegian working class to the extent that might be expected. Although the cost of living advanced very materially, the increase in wages was larger in proportion. For the majority of the Norwegian laborers the increased earnings only meant larger expenditures for nonessential commodities. Their standard of living was naturally raised considerably during the war, but when normal conditions are restored and the competition from foreign countries with more settled labor conditions forces the wages to decrease in Norway, it will be difficult for the Norwegian laboring people to adjust themselves to the new conditions. The Norwegian laborers have, generally speaking, failed to take advantage of the favorable conditions to better their position during the war. Frequent strikes, the shifting from one place to another, and general unrest have hampered their earning capacity. Lack of ambition and enterprise are the characteristics of a great many of the Norwegian laborers at the present time.

In order to cope with the difficult labor question the lumber mills established in 1917 an employers' association, which is a branch of a national organization of employers covering all industries of the country. Most of the large lumber-mill owners belong to this association. The association undertakes to establish a uniform scale of wages for all its members and acts as the representative for the members in all labor questions.

As in Sweden and Finland, most of the work in the Norwegian mills is done on a contract basis. The contracts between the mills and their crews vary to some extent, as the working conditions, machinery, etc., of each mill are taken into consideration in establishing the contracts, but they are made in such a way that the crews in the various mills are earning about the same wages. By this arrangement there is no inducement for the men to shift from one mill to the other in order to better their conditions. Without such an organization the mill owners would soon be at the mercy of their men and one mill would compete with another in regard to labor. This association also cooperates with the employers' associations in the neighboring countries.

Since the outbreak of the war the working hours have been reduced from 57½ hours per week to 54 hours. It is almost certain that the 8-hour day will be instituted in Norway, following the example of Sweden and other countries.

On account of these difficult labor conditions it is believed that the Norwegian plants will have to consider the installing of a great many labor-saving devices, such as conveyors, automatic stackers, etc.

SCALE OF WAGES.

In order to give an idea of the average wages paid in the Norwegian plants, the following schedules are given: The contracts of the employers' association members generally stipulate a certain compensation for the head sawyer per 100 logs sawn and other members of the mill crew receive a certain percentage of the head sawyer's compensation.

The crew is divided into three groups: (1) Yard crew; (2) skilled laborers, such as head sawyers, edgermen, resawyers in planing mill, operators of planer, graders, and filers; (3) assistant sawyers in saw and planing mills, trimmers, assistant operators of planer, unskilled laborers in saw and planing mills.

Group No. 1.—Basis, $10.99 per week; $4.02 per week increase for men 18 years and older; $2.01 per week increase for men less than 18 years of age; $0.54 per week increase for each member of family (average 3 members). The wages of this group would average $16.63 per week or $0.31 per hour.

Group No. 2.—Basis, $10.17 per week; same increases as group No. 1. The wages of this group would average $15.81 per week or $0.29 per hour.

Group No. 3.—Basis, $8.83 per week; same increases as group No. 1. The wages of this group would average $14.47 per week or $0.27 per hour.

In addition to these wages the employees generally receive fuel free of charge for their households, valued at $26 per year and up. As a rule, the wages paid in most of the mills would be somewhat higher, depending upon the efficiency of the crews.

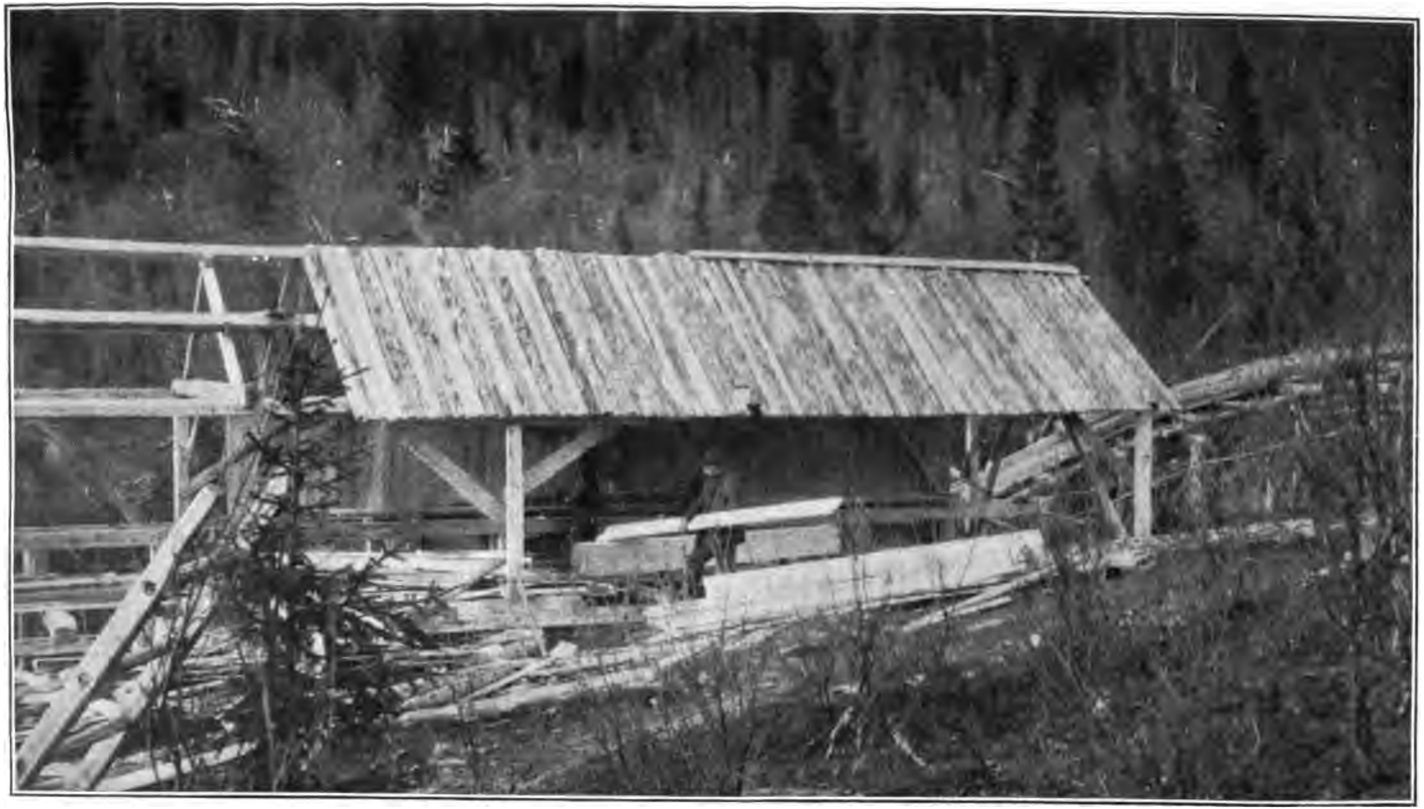


FIG. 33.—TYPICAL SMALL SAWMILL.

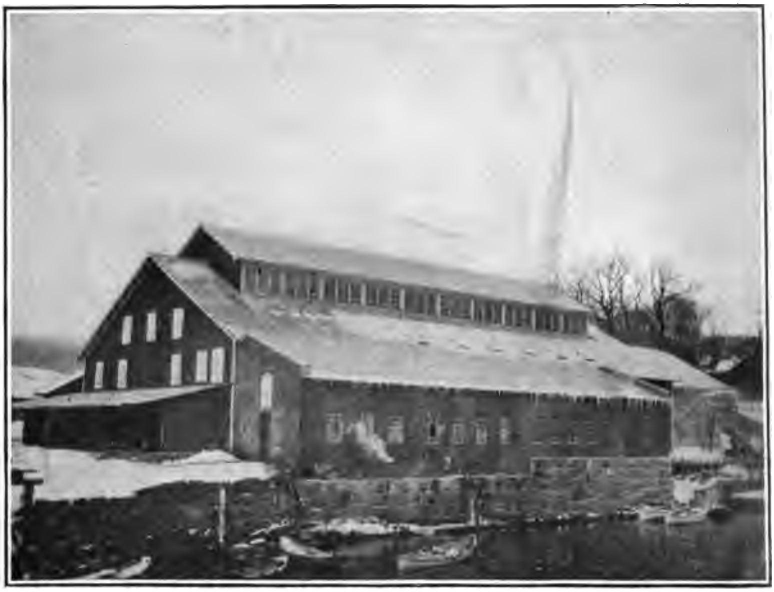


FIG. 34.—PLANING MILL.

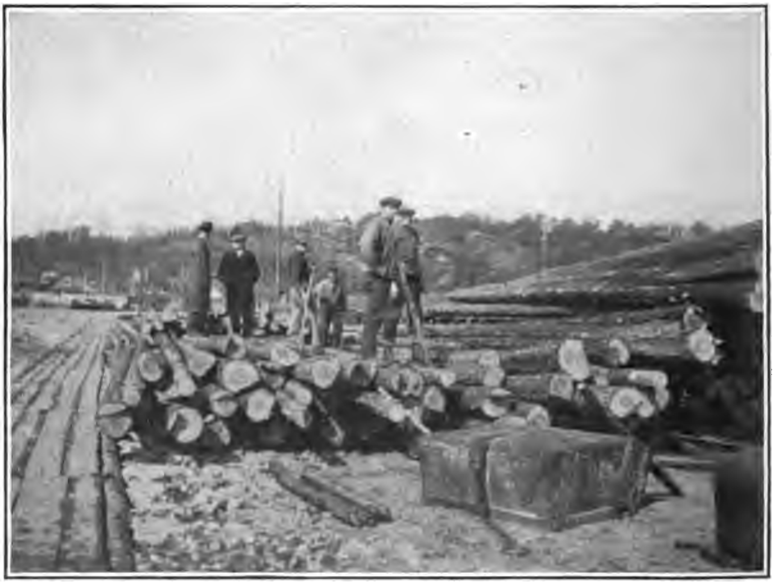


FIG. 35.—UNLOADING TELEPHONE POLES FROM RAILWAY CARS.
For this work 54 cents per piece was demanded in the spring of 1919.

For certain work in the plant straight daily wages are paid as follows:

Engineers	$1.47	Carpenters	$1.61
Firemen	1.47	Watchmen	1.34
Oilers	1.47	Teamsters	1.47
Repair men	1.47	Clean-up men in mill	1.41
Blacksmiths	1.61	Common laborers	1.15
Assistant blacksmiths	1.47		

In addition to these wages an increase of $2.68 per week for men 18 years and older and $1.34 for men less than 18 years of age is paid, and an additional increase of $0.27 per week for each dependent member of the family. The increase would thus be about $0.58 per day for men 18 years and older.

During the first five week days 25 per cent increase is given for the two first hours of overtime. At all other times, weekdays or holidays, 50 per cent increase is given and on certain holidays 100 per cent.

The above-mentioned scale of wages was not considered satisfactory, and in the spring of 1919 the laborers demanded an 8-hour working day and $0.54 per hour as minimum wages with 50 to 150 per cent for overtime and two weeks' vacation annually with full pay.

WAGE INCREASES IN RECENT YEARS.

The following table shows the average wages per hour paid in all Norwegian sawmills and planing mills, the wages paid by industries that base their production on export, and the wages for carpenters, masons, etc., from 1911 to 1919:

	1911	1914	1916	March, 1918.	August, 1918.	January, 1919.	Increase, 1911–1916.
							Per cent.
Saw and planing mills	$0.111	$0.126	$0.164	$0.244	$0.306	$0.311	180
All industries based on export of their products	.112	.132	.168	.268	.319	.351	213
Carpenters, masons, etc.	.140	.155	.186	.295	.388	413	194

Average daily wages in woodworking plants was as follows in 1914:

Employees in sawmills and planing mills:	
Men 19 to 60 years of age	$1.14–$1.25
Men 60 years of age and up	.98– 1.10
Men less than 19 years of age	.57– .77
Average, all ages	1.08– 1.16
Men 19 to 60 years of age:	
Sawmills	1.14– 1.25
Planing mills	1.13– 1.24
Stave plants	1.18– 1.29
Box factories	1.09– 1.31
Yards	1.20– 1.32
Power plants	1.13– 1.25
Common labor	.97– 1.07

The average wages paid in 1913 and 1918 are compared in the following table. Besides the wages paid the employees were given free fuel, valued at not less than $25 in 1918 and at about $12 in 1913.

Employments.	1913	1918
Sawmills:		
Men on bull chains	$1.24	$2.81
Pond men	1.21	2.39
Head sawyer	1.44	2.71
Assistant sawyer	1.06	2.52
Edger man	1.44	2.71
Assistant edger man	1.06	2.02
Trimmer in mill	1.17	2.50
Stave cutter	1.30	2.81
Filer	1.44	2.73
Firemen and repair men	.94	2.28
Clean-up men	.90	1.88
Planing mills and box factories:		
Resawyer	1.43	2.75
Assistant resawyers	1.43	2.58
Planing mills and box factories—Continued.		
Operator of planer	$1.24	$2.68
Feeder of planer	.78	2.21
Car pusher from yard to mill	1.40	3.08
Filer	1.38	2.65
Yards: Pilers	1.34	3.02
Docks:		
Graders	1.27	2.63
Loaders in barges	1.17	2.84
Common labor	.80	2.01
Foremen for sawmill and planing mill	[1] 536.00	[1] 965.00
Assistant foremen for sawmill and planing mill	[1] 402.00	[1] 643.00

[1] Per year. The mill foremen usually receive free rent and light.

PIECEWORK CONTRACTS.

The following schedules are representative of contracts made in regard to labor in the sawmills, box factories, yards, and docks. These schedules refer to 1918.

Sawmill.—Head sawyer's compensation, $1.88 per 100 logs; for logs less than 12 feet, $0.94 per 100. Passing logs twice through gang, 50 per cent increase. Assistant sawyer's compensation, $1.55 per 100 logs; for logs less than 12 feet, $0.78 per 100.

Sawing of staves.—Longer than 28 inches and 4 or more inches in width, $1.11 per 1,000 pieces; longer than 28 inches and 3½ inches or less in width, $1.04 per 1,000 pieces; shorter than 28 inches and 4 or more inches in width, $0.95 per 1,000 pieces; shorter than 28 inches and 3½ inches or less in width, $0.75 per 1,000 pieces; 16 inches and shorter, random widths, $0.70 per 1,000 pieces. The compensation for the sawing of staves is divided as follows: Head sawyer, 30 per cent; edger man, 21 per cent; assistants, 49 per cent.

Planing mill.—Operator of planer, $0.061 per 1,000 linear feet; feeder of planer, $0.045; assistant operator, $0.035; graders and trimmers of planed stock, $0.061; resawyers, $0.061.

Box factory.—Trimming of rough stock: 4, 3½, and 3 by 9 inches and wider, $0.38 per 100 pieces; 2½ and 3-inch stock, $0.34; 2-inch stock, $0.25; boards, $0.17. This compensation is divided as follows: Trimmer, 52½ per cent; assistant trimmers, 47½ per cent. Resawing (6 men), total $0.21 per 1,000 linear feet; planing (2 men), total, $0.066 per 1,000 feet. Trimming of box shooks: Per bundle of 10 pieces, $0.003; per bundle of 60 pieces, $0.0075; per bundle of 150 pieces, $0.178. Resawing of rough shooks, from 6 to 26 feet, $0.24 per 100 pieces. Planing of shooks: Less than 20 inches long, up to 7 inches wide, $0.013 per 100 pieces; from 20 to 30 inches long, up to 7 inches wide, $0.013; up to 30 inches long, wider than 7 inches, $0.016. Branding of shooks machine), $0.016 per 100 pieces.

Yard.—Transport from yard to planing mill: 4, 3½, and 3 by 7½ inches and wider, $0.55 per 100 pieces; 3 and 2½ by 7 inches and less, $0.46; 2-inch stock less than 7 inches wide, $0.32; boards, $0.18.

Grading.—The prices vary from 53 to 67 cents per 100 pieces for planks, 45 to 61 cents for battens, and 19 to 27 cents for boards.

Trimming.—For trimming rough stock by hand on dock prices range from 17 cents per 100 pieces for boards up to 75 cents per 100 pieces for planks.

Sheds.—Piling of planed boards, $0.082 per 1,000 linear feet; piling of rough boards, $0.174 per 100 pieces; piling of rough planks, $0.316 per 100 pieces.

Branding.—Per 100 boards, branded at one end, $0.009; branded at two ends, $0.024; per 100 planks, branded at one end, $0.028.

Loading.—Carrying lumber to barge, $0.13 per thousand feet board measure.

The foregoing rates of pay must not be considered as average rates. They have been selected from a great number of contracts as representative for the various kinds of labor and refer to work by the ordinary mill crews. When the work is of a temporary nature the rates are much higher.

As an example of the exorbitant demands made in regard to wages by the laborers in one of the southeastern ports of Norway, the laborers demanded $0.54 per piece to unload telephone poles from railroad cars to the dock (April, 1919).

COST OF PRODUCTION.

Only the largest and most efficiently operated mills keep an accurate account of the cost of production. A great many mills show considerable neglect in this respect, and it may be said that the value of statistical information is not generally appreciated among the majority of the Norwegian lumber mills. Efforts to establish a standard system of cost accounting for the mills have not been undertaken.

In ascertaining the cost of production of the Norwegian lumber mills it is believed to be the better plan to consider mills operating with purchased saw logs, because most of the mills acquire their raw material in this way. The figures given below refer to standard export mills in southeastern Norway, where the majority of the mills are located. Conditions naturally vary a great deal, and as there are no official or other statistics published giving the cost of production it is a difficult matter to arrive at exact figures. Many of the mills in Norway, especially before the war, were able to operate at a lower cost than given in this statement. The cost of production for 1918 represents the highest in the history of lumber industry in Norway.

Since the armistice the cost of the raw material has decreased somewhat, but the cost of labor has increased. Conditions in Norway will, no doubt, become more settled, but the prewar level will not likely be regained.

It may be estimated that about 117 to 119 cubic feet of raw material, based on top diameter measurement, would be required to cut 1,000 board feet of planks, battens, or boards. A general average figure for all mills can not be given, because production largely depends upon such factors as the taper of the logs, sawing systems used, whether the logs are passed once or twice through the gang saws, and the amount of wane given the lumber. When sawing small logs it is evident that the waste will be greater than when the log dimensions are large. In general, the standard Norwegian mills obtain about 70 per cent of planks, battens, and boards when cutting logs.

When a rational system of sawing and utilization of the waste material is effected practically the only part of the saw log which represents a dead loss is the shrinkage.

The value of the waste material should be taken into consideration. It may seem that the cost of production in many cases would be so heavy that no profit and at times even a loss would result from the operation, but in such cases the mill's profit may be dependent upon the sale of the waste material. The best economic results are obtained when the mills operate pulp factories, planing mills, and box factories, which combined are in a position to turn every cubic inch of waste material into profit. The value given the raw material in the following statement is believed to be a fair average for all districts:

Items.	1914	1918
	Per cubic foot.	*Per cubic foot.*
Logs delivered at main floating river (average dimension $7\frac{7}{8}$ inches by $24\frac{1}{2}$ feet; average contents 8.27 cubic feet)	$0.155	$0.340
Floating and towing logs to mill	.011	.016
Interest on cost of logs during floating	.003	.006
Purchasing agent's commission, inspection, and scaling	.003	.006
Loss of sunken logs	.003	.006
Total	.175	.374
	Per M feet.	*Per M feet.*
Cost per thousand feet board measure (118 cubic feet per thousand)	20.65	44.13
Sawmilling, yarding, and shipping:		
Wages	.93	1.85
Foremen	.13	.27
Supplies	.13	.80
Repairs	.05	.14
Fire insurance	.09	.27
Liability insurance	.02	.03
Administration	.34	.60
Depreciation of plant	.13	.20
Taxes	.03	.07
Interest	.45	.87
Foreign agent's commission, discount, etc	.84	1.88
Total	23.79	51.11
Value of refuse	1.00	3.00

The cost of operating a standard planing mill in Norway, based on 1,000 board feet of output, is given for 1914 and 1918 in the following table:

Items.	1914	1918	Items.	1914	1918
Wages	$2.08	$4.26	Liability insurance	$0.03	$0.03
Foremen	.16	.24	Depreciation	.15	.27
Supplies	.16	.32	Interest	.36	.87
Repairs	.05	.08	Administration	.41	.68
Insurance, mill	.06	.09			
Insurance, sheds	.06	.14	Total	3.52	6.98

Comparing these statements with the cost of production in most of the Swedish mills, it is seen that the cost of raw material is much higher in Norway. On the other hand, the overhead charges in Norwegian mill operations are smaller, because the mills are of smaller capacity.

A study of the relation between the cost of the raw material and the f. o. b. prices of the lumber produced clearly shows the difficult position in which many of the Norwegian lumber exporters now find themselves.

The following table shows the relative increase of the cost of saw logs and the f. o. b. prices of planed lumber for export from 1893 to 1919. These statistics refer to a district in Norway having excep-

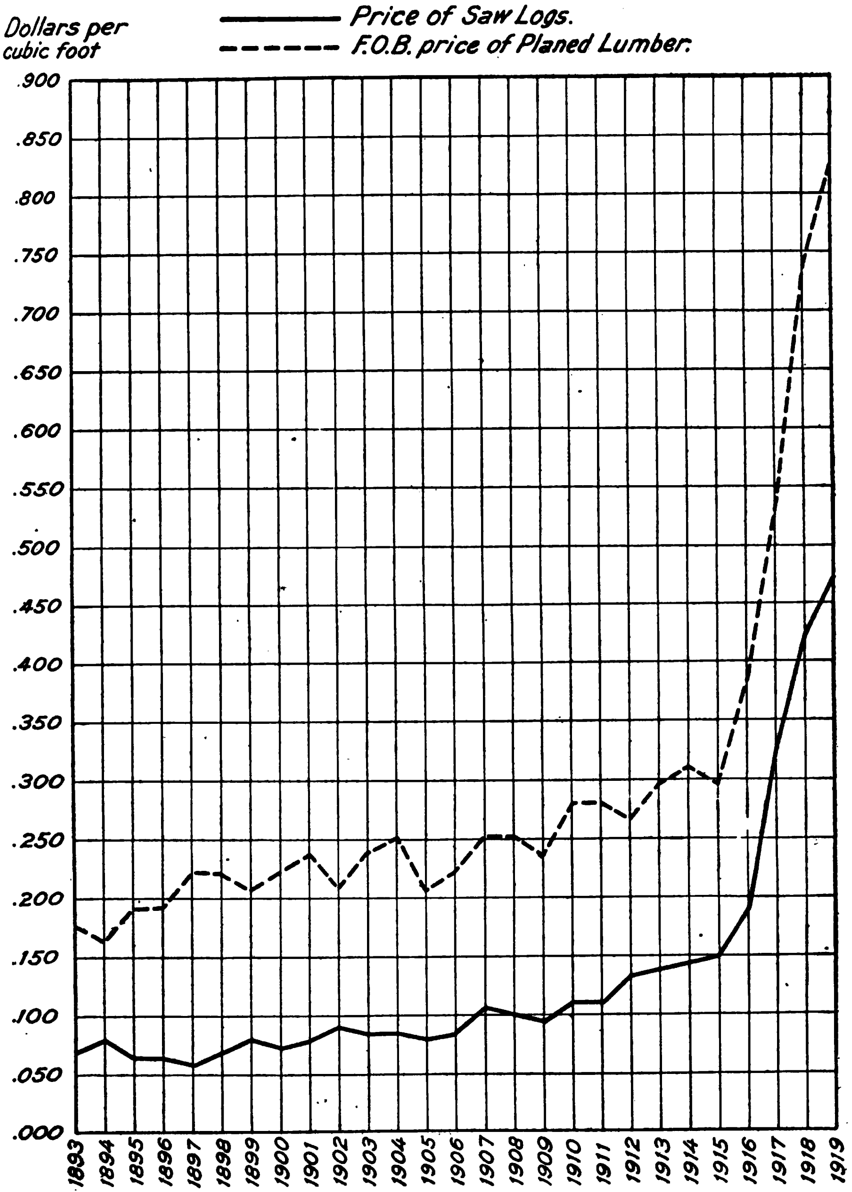


FIG. 36.—Relation between cost of saw logs and selling price of planed lumber.

tionally high cost of saw logs. In other districts the cost of the saw logs has not increased to such a large extent.

Year.	Saw logs per cubic foot.	Planed lumber per M feet.	Year.	Saw logs per cubic foot.	Planed lumber per M feet.
1893	$0.068	$14.75	1907	$0.105	$20.89
1894	.079	13.52	1908	.100	20.89
1895	.063	15.98	1909	.094	19.66
1896	.063	15.98	1910	.110	23.35
1897	.058	18.43	1911	.110	23.35
1898	.068	18.43	1912	.131	22.12
1899	.079	17.20	1913	.136	24.58
1900	.073	18.43	1914	.142	25.81
1901	.079	19.66	1915	.147	24.58
1902	.089	17.20	1916	.189	31.95
1903	.084	19.66	1917	.325	44.24
1904	.084	20.89	1918	.419	61.45
1905	.079	17.20	1919	.472	68.82
1906	.084	18.43			

The foregoing table shows exceptionally unfavorable conditions and there is no doubt that the majority of the Norwegian mills operated with a very small margin of profit before the war. It was frequently contended that the foreign agents handling Norwegian lumber made a larger profit on the sales than the Norwegian exporters. The proof of this assertion is that several of the largest mills in Norway closed down during the last 10 years before the war. Some of the owners had extensive timber holdings, but found that they could realize a more satisfactory profit by limiting their activities to the logging operations.

During the first years of the war, 1915 and 1916, the cost of production was reasonably low and the high prices obtained for lumber and lumber products abroad netted the Norwegian lumber exporters very substantial profits. During the following years of the war and up to the present time the cost of production has steadily increased and more rapidly in proportion than the increase in the selling price of the lumber. It is believed, however, that the satisfactory profits made by the lumber exporters in Norway during the early part of the war will carry them through the present precarious times. It is evident that the financial standing of the Norwegian lumber exporters is usually satisfactory at present.

GRADING.

ROUGH LUMBER.

There are no uniform grading rules covering the whole country, but it seems that the local grading rules used by the standard mills in each district are fairly uniform. It should be noted, however, that there are no written grading rules in Norway.

The grading rules in the Trondelagen district are somewhat more strict in regard to the amount of wane than in southeastern Norway, but the lumber in the Trondelagen district is generally more knotty. A few individual concerns in southeastern Norway have instituted grading rules that are more strict than those used by the other shippers. These rules have been adopted to meet special market requirements supplied by these exporters.

It is therefore impossible to give definite grading rules for Norway. For practical purposes it may be said that the rules are similar to those for the Harnosand district in Sweden but somewhat more lax in regard to the number of knots and wane admitted. (See the complete report on Swedish grading rules in the report on the Swedish lumber industry.)

Most of the firms in Norway grade rough lumber into two or three grades only, namely, unsorted grade, which consists of first, second, third, and fourth grade log run, and another grade which is a better class of cull lumber and is called fifth grade. A poorer class of cull lumber is called sixth grade. Sixth grade is not often exported, but is used locally. It appears from the records of most of the larger concerns in Norway that they obtain about 80 to 85 per cent of unsorted grade and 15 to 20 per cent of fifth and sixth grades combined.

Formerly many mills graded planks into five different grades for shipment to France. This practice, however, will likely be discontinued in the future, as considerable trouble and complaints were often experienced in regard to such shipments. One shipper, for instance, stated that on a shipment of 5,000 planks a French importer filed a claim because 12 pieces were off grade. This may be an extreme case, but it clearly shows how far the importers will go at times in regard to complaints.

Some firms that grade their lumber into six different qualities often find that the proportion of first quality is less than 1 per cent. Only in rare cases would it pay the Norwegian exporters to grade their lumber into more than three grades, namely, unsorted, fifth, and sixth grades.

Lumber absolutely free from knots is hardly obtainable in Norway except in very short lengths and not in commercial quantities.

PLANED LUMBER.

The grading of planed lumber in Norway is not uniform in the various districts, and there are no printed grading rules. The grading is generally effected in the same way as in Sweden. It is generally conceded that the planed lumber is better manufactured in Norway, although the quality of the lumber itself is not equal to the Swedish planed stock, mainly on account of the many knots present in Norwegian lumber.

Pine lumber is usually graded into three grades—first, second, and third—and also into unsorted grade, comprising all of the three mentioned grades. There are one or two grades of cull pine lumber, which is seldom exported but used locally.

Spruce lumber is graded into mixed grade (second grade and better) and third grade and also into unsorted grade, comprising the two mentioned grades. First and second grades of spruce stock are never sold separately. There are one or two grades of cull spruce lumber, which are generally sold locally.

Since the war it has become the custom to sell planed lumber in the unsorted grade only, and this procedure will likely be followed in the future, according to the latest decision by the Norwegian exporters, as the percentage of the upper grades is very small.

Lumber for British colonial markets is graded into colonial first grade, which is a mixture of first and second grades, and colonial third grade, which corresponds to third grade.

The result of the grading of pine lumber may be as follows: First grade, 15 per cent; second grade, 55 per cent; third grade, 30 per cent. The grading of spruce lumber generally gives 65 per cent of mixed grade and 35 per cent of third grade. The percentage of cull lumber may vary from 10 to 15. In many districts of Norway the percentage of first grade is less than 5. First grade is by no means free from knots.

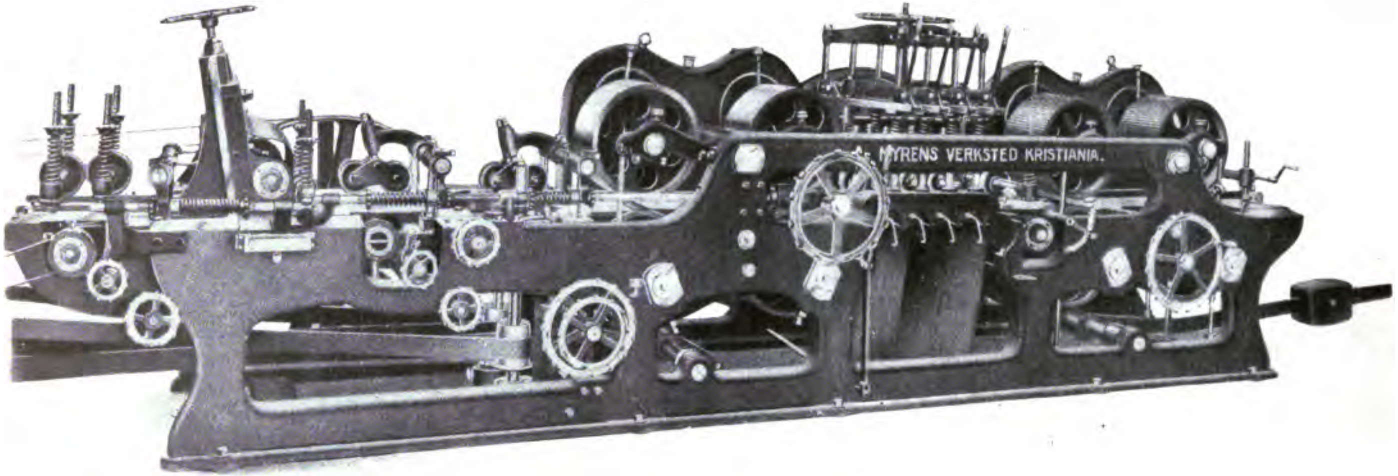


FIG. 37.—TYPE OF FAST-FEED PLANER.

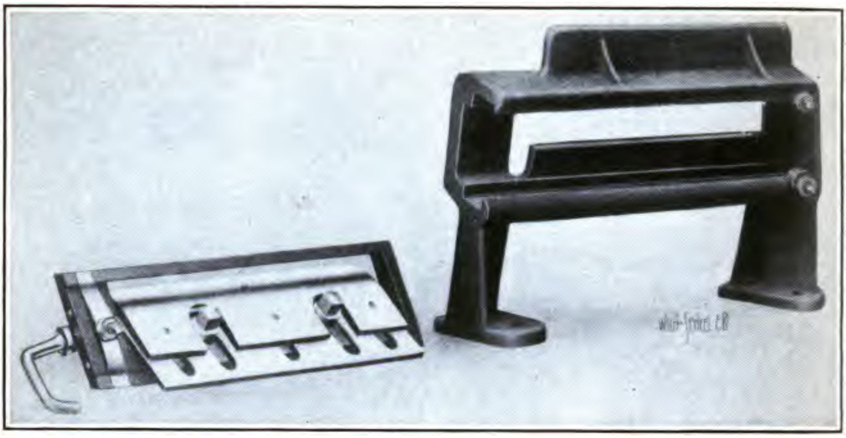


FIG. 38.—FIXED KNIFE USED IN PLANER.

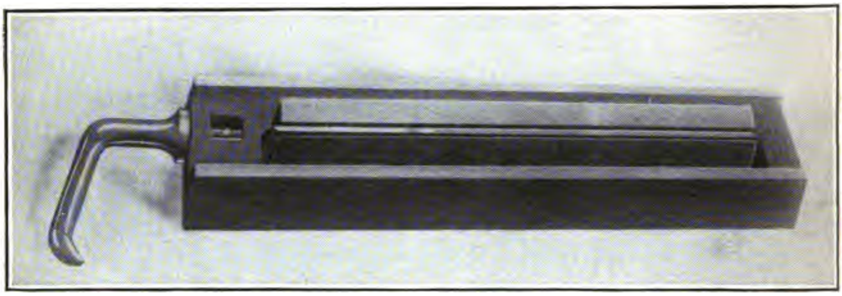


FIG. 39.—FIXED KNIFE USED IN PLANER.

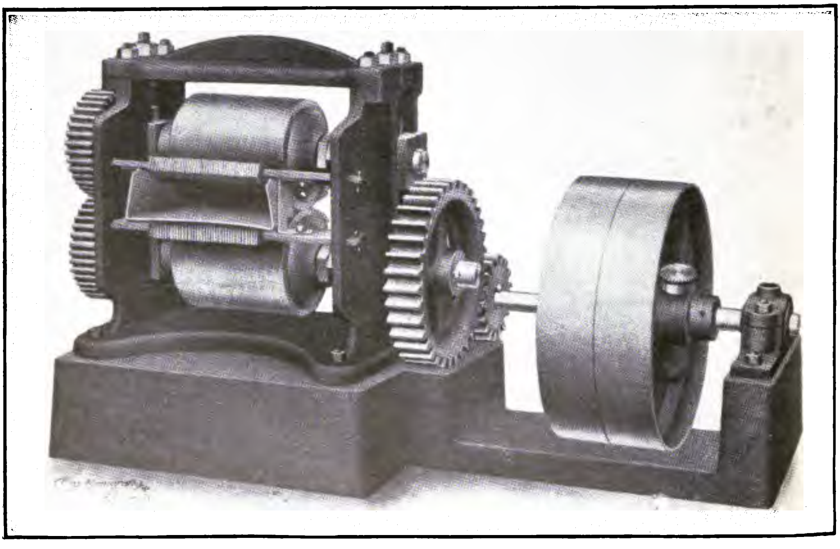


FIG. 40.—MACHINE FOR MANUFACTURING EXCELSIOR.

LUMBER EXPORT TRADE.

Lumber and other forest products have for centuries constituted the principal commodities of export from Norway. From the history of Norway it appears that wood products were exported to Iceland as early as 880 A. D., but the trade was not carried on to any large extent before about 1300. At that time a scarcity of wood was felt in many countries in Europe. The lumber trade at the start was mainly in the hands of the Dutch merchants, who sent their ships to Norway for lumber and distributed it to the other European countries. Later on the Norwegian lumber merchants themselves went into foreign markets, and as Norway for centuries has had a large merchant marine, the lumber exporters were materially assisted in their work by having adequate shipping facilities.

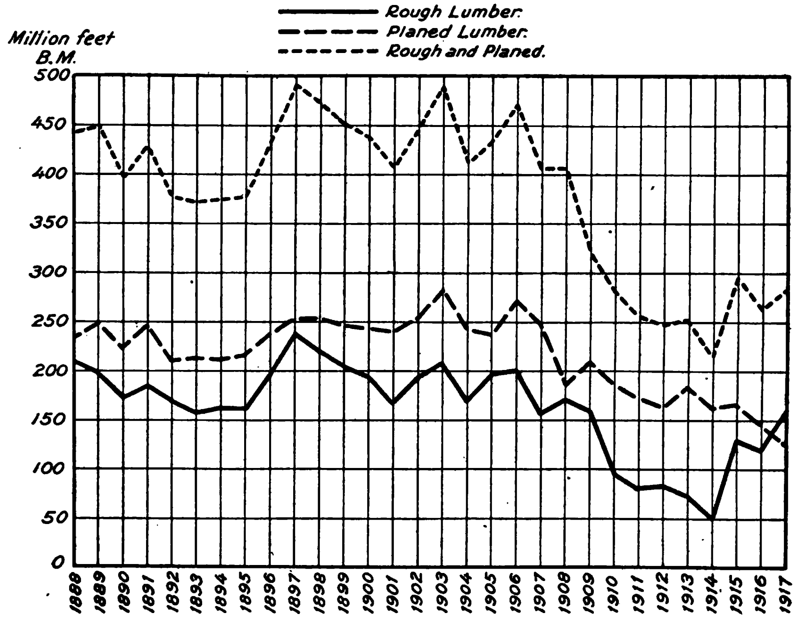


Fig. 41.—Exports of rough and planed lumber

Round and hewn timber formerly constituted the largest part of the exports, but after the construction of a large number of sawmills in Norway the character of the shipments changed.

A further manufacture of wood for export started about 60 years ago, after the establishing of planing mills in Norway. The tendency to export wood manufactured to the highest possible extent has increased during the last half century, and during late years planing-mill products and box shooks have constituted the bulk of the lumber products exported from Norway.

Up to 1893 a small export duty was imposed on lumber shipments, but since that year no export duty has been in effect.

The lumber export trade reached its highest point about 15 to 20 years ago, and has since that time steadily declined in quantity until the outbreak of the war. Owing to the high prices and the great demand abroad for lumber products during the war, the exportation from Norway increased somewhat during the early part of the war, but it is not likely that the increase will be maintained, as the Norwegian forest resources are too limited to yield the necessary quantities of raw material to produce such large quantities for export. The value of the exports of timber and lumber of all kinds reached its maximum in 1917, when it amounted to $19,850,000, against $9,120,000 in 1913.

Of round and hewn timber Norway exported considerable quantities before the war, but since 1903 and until the outbreak of the war the quantities decreased more than 50 per cent for round timber and about 30 per cent for hewn timber.

The decrease in the quantity of lumber and timber exported from Norway during the last few decades is mainly due to the increased production of pulp and paper in the country, but has also been affected by the increased demand for wood products in the domestic markets.

The value of the exports of wood of all kinds and of pulp, cellulose, and paper is shown in the following statement:

1866–1870, average	$8, 239, 000	1906	$12, 020, 000
1871–1875, average	11, 818, 000	1907	11, 771, 000
1876–1880, average	9, 479, 000	1908	9, 313, 000
1881–1885, average	9, 630, 000	1909	9, 292, 000
1886–1890, average	8, 432, 000	1910	9, 778, 000
1891–1895, average	7, 550, 000	1911	9, 157, 000
1896–1900, average	10, 689, 000	1912	8, 642, 000
1900	11, 450, 000	1913	9, 120, 000
1901	9, 539, 000	1914	8, 512, 000
1902	10, 259, 000	1915	14, 730, 000
1903	11, 925, 000	1916	17, 632, 000
1904	9, 460, 000	1917	19, 850, 000
1905	9, 356, 000		

The value of the different products making up the total for 1917 is given below:

Hewn and round timber:	
Spars and small round timber	$77, 000
Saw logs and other round timber	55, 000
Telegraph poles	1, 200
Mining timber	58, 400
Pit props	1, 569, 400
Pulp wood	15, 300
Split wood, firewood, etc	1, 700
Planed and sawn lumber and timber:	
Planed lumber	7, 004, 900
Box shooks, planed and rough	3, 664, 300
Staves	149, 600
Sawn timber	2, 500
Planks, battens, and scantlings	7, 000, 500
Boards	210, 000
Cull lumber, laths, etc	40, 000
Sawn railroad ties	200
Total	19, 850, 000

A similar separation of the products and their value in 1913 gives the following details:

Timber and lumber longer than 75 inches:	
Planed lumber of all kinds	$4,582,600
Sawn lumber—	
Planks, battens, and boards	1,529,300
Cull lumber, laths, etc	49,400
Round timber—	
Spars and small round timber	103,400
Telegraph poles	77,200
Mining timber	301,900
Pit props	57,700
Small round timber, Dutch specifications	14,100
Hewn timber—	
Hewn timber	176,700
Small hewn timber, Danish specifications	118,000
Timber and lumber shorter than 75 inches:	
Box shooks, planed and rough	1,575,400
Staves of pine and spruce	298,200
Staves of birch	8,600
Pit props	155,700
Railroad ties	3,000
Pulp wood	2,700
Split wood, firewood, etc	66,400
Total	9,120,300

The value of the exports of wood pulp, cellulose, and paper from 1871 to 1916 is given in the following statement:

1871–1875, average	$107,000	1906–1910, average	$14,606,000
1876–1880, average	724,000	1911	16,402,000
1881–1885, average	1,742,000	1912	19,886,000
1886–1890, average	2,653,000	1913	22,485,000
1891–1895, average	4,476,000	1914	21,333,000
1896–1900, average	7,129,000	1915	28,810,000
1901–1905, average	9,273,000	1916	45,480,000

PREPARATION OF SHIPMENTS.

When the rough lumber is sufficiently dry for shipping it is taken to the docks to be trimmed and graded. There are few mills in Norway that have a modern system of conveyors for the transportation of the lumber from the piles to the docks. The transportation is usually effected on trucks drawn by horses.

The lumber is carefully trimmed at both ends to give it a nice, clean-cut appearance. Stock which has not been trimmed before it is piled is more easily sold, because it can be trimmed to any standard of measurement desired by the different markets. The lengths are generally cut in accordance with the measurements of the country of destination. The tendency will be, no doubt, to follow the Swedish and Finnish example and trim only to English feet or metric measurements. A great many mills in Norway still trim their lumber by hand, which is awkward and very expensive, while more modern mills have trimmers operated by electricity on the dock similar to those described in the report on the Swedish lumber industry.

The grading is very carefully done, and each piece is turned over before a decision is reached by the grader.

From the dock the lumber is loaded into barges and tallied. Each piece of lumber is then branded, at one or at both ends, according to the desire of the importer. The branding is effected either by applying a stamp made of a rubber or gelatine composition or by using a steel stamp, which is sunk into the wood by a blow of a hammer. The brands may be put on in different colors. The branding cost only about 1 to 2 cents per thousand feet before the war, and at the present time costs 2 to 3 cents per thousand feet. This expense is borne by the exporter.

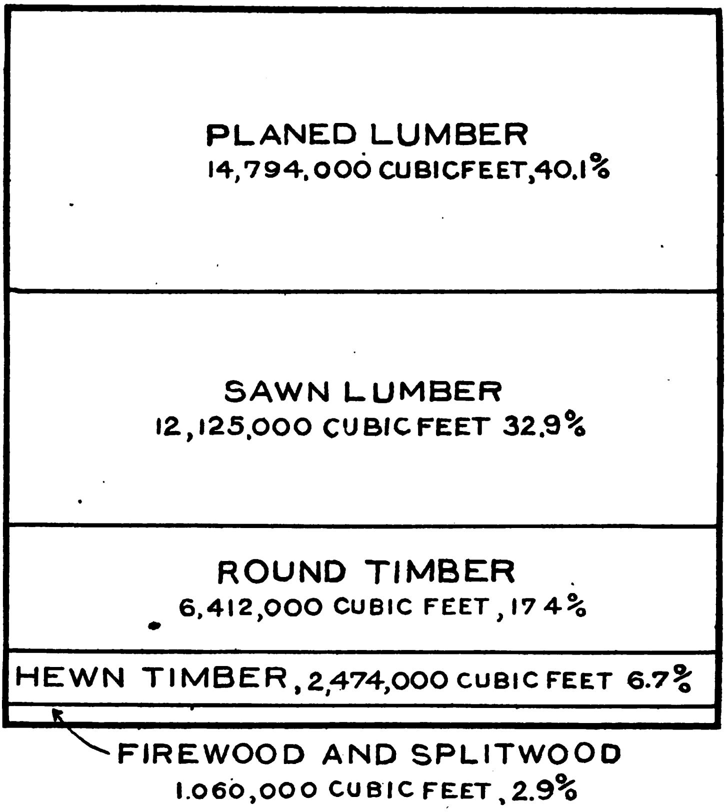


FIG. 42.—Exports of lumber and timber in 1913.

The bundling of planed lumber for shipment is usually stipulated in each contract. The following schedule gives an idea of the practice followed for the different markets:

London market:
- ½ by 4 up to 11 inches must be bundled.
- ⅝ by 4 up to 11 inches must be bundled.
- ¾ by 4 up to 7 inches must be bundled.
- ¾ by 8 up to 11 inches need not be bundled.
- ⅞ by 4 up to 5 inches must be bundled.
- ⅞ by 5½ up to 11 inches need not be bundled.
- ¾ by 4 up to 11 inches must be bundled.
- 1 by 4 up to 5 inches must be bundled.
- 1 by 5½ up to 11 inches need not be bundled.
- 1¼ by 1½ by 5½ inches need not be bundled.

West coast of England:
- ¾ by 7 inches and wider need not be bundled.
- ¾ by 6½ inches and less must be bundled.

Australia and South Africa:
⅞ inch and thicker need not be bundled.
¾ inch and less must be bundled.
Holland:
¾ inch and up need not be bundled.
⅝ inch and less must be bundled.
Denmark:
(There is no specific rule. The bundling is dependent upon the buyers' orders in each case.)

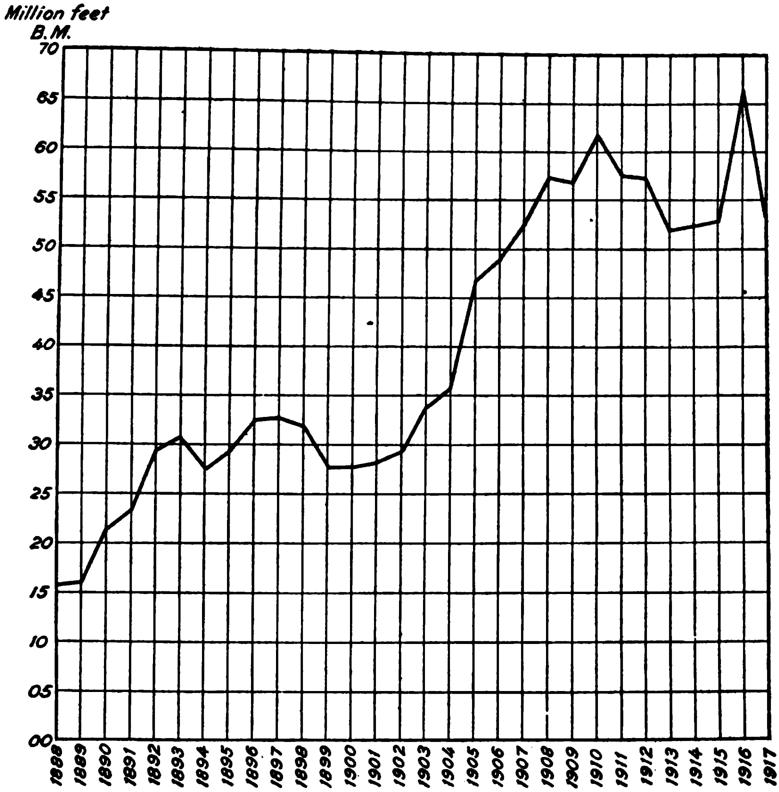


FIG. 43.—Export of box shooks, planed and rough.

The bundles for all markets are usually made up in the following way:
½-inch boards, 6 to 8 boards to the bundle.
⅝-inch boards, 5 to 6 boards to the bundle.
¾-inch boards, 4 to 6 boards to the bundle.
⅞-inch boards, 5 boards to the bundle.
1-inch boards, 5 boards to the bundle.
Weatherboards, 4 boards to the bundle.
The tying of the lumber may be by either wire or string.

When the barges are loaded they are towed alongside the steamer and the lumber is taken on board. Manila rope is used whenever possible to avoid breakage of the lumber, and when chains must be used they are covered. Only in a few cases do the steamers load from the dock, and this is only done in the loading of box shooks. The barges are nearly always covered and loading is not done during a rain. The steamers may take on board from 160 to 400 thousand feet in 10 hours, according to the local conditions in each district.

After each shipment the mill ends are carefully gathered, and if suitable stock for export they are trimmed to lengths of 1 foot up to 5½ feet on the half foot. If sold locally in Norway, the mill ends are not trimmed. This stock is called split wood. Formerly split wood was an important article for export, but during late years local box factories in Norway have offered a good market for it, so that the exportation has declined very materially, and Norwegian box factories import considerable quantities of this material from other northern European countries.

ROUND AND HEWN TIMBER.

MAST TIMBERS.

It is evident that in a country like Norway, where the cutting of timber has been carried on for centuries, there can not be any extensive areas of virgin forests left, and the supply of heavy mast timbers must therefore necessarily be limited.

The heavy timbers produced in Norway originate chiefly in the regions on the west side of Christiania Fiord. Small quantities of spars for ship rigging and timber for scaffolding and building are supplied in lengths from 36 feet up to 80 or 90 feet. The timber measures at the middle from 6 to 15 inches in diameter. Timbers longer than 60 to 70 feet are rare, as the transportation of such material is extremely difficult and such long timber is only found in the interior districts. Norway can not be considered as an important source of supply for this material.

The competition with steel spars and masts has been very keen during late years, and wooden masts are not often used for the larger type of vessels but are mainly confined to smaller boats.

The following prices were paid before the war for mast and spar stock: 6–6¾ inches diameter at middle, 3 inches at top, 36 feet long and up, 27 cents per cubic foot; 7–7¾ inches diameter at middle, 3½ inches at top, 36 feet long and up, 29 cents per cubic foot; 8–8¾ inches diameter at middle, 4 inches at top, 40 feet long and up, 31½ cents per cubic foot; 9–9¾ inches diameter at middle, 4½ inches at top, 40 feet long and up, 34 cents per cubic foot; 10–10¾ inches diameter at middle, 5 inches at top, 45 feet long and up, 37½ cents per cubic foot; 11 or more inches diameter at middle, 5½ inches at top, 45 feet long and up, 40 cents per cubic foot.

TELEGRAPH AND TELEPHONE POLES.

The taper of the trees in Norway seems to be favorable for complying with the foreign specifications for telegraph and telephone poles. This stock is furnished in considerable quantities from the districts bordering the Skien shipping district. It is shipped mainly to the United Kingdom.

In the future it is not believed that telegraph poles will be exported in any large quantities, as the industrial development of Norway will require a large supply of poles for the network of feed wires transmitting electric power.

PULP WOOD.

The exportation of pulp wood has declined materially during the last decades as a consequence of the rapid development of the pulp and paper industry in Norway, which is requiring all the material which the country can produce, besides large quantities of pulp logs imported from other countries.

MINING TIMBER.

Mining timber is an important item in export trade. It is shipped chiefly to the United Kingdom. This stock is generally low-grade logs not desirable for saw logs. The stock is cut square at the butt end and a part of the bark is removed on four opposite sides. The lengths vary from 10 to 45 feet, the average being about 18 feet. The average top diameter is approximately 4 to 6 inches.

Before the war this stock was sold at 12 cents per cubic foot and in 1919 at 44 cents.

PIT PROPS.

The exportation of props from Norway is probably chiefly responsible for the reckless cutting of the Norwegian forests. Until recently there were few restrictions in regard to cutting, and the smaller forest owners cut young trees and saplings for props. In the future it is believed that a better understanding of forest management in connection with stricter laws will largely check the output of props, and those produced will be obtained from top logs or from trees cut in accordance with a system of improvement thinning. Both pine and spruce are used, but as spruce is extensively used by the pulp factories, pine is chiefly cut for props.

There are two classes of props, long and short. The long props are cut 10 feet minimum length, with an average length of 15 to 17 feet. They are trimmed on odd and even feet. The minimum top diameter is 3 inches and the maximum top diameter 9 inches. Short props are cut 2½ feet and up on the half foot, with 2 to 2½ inches as minimum top diameter and 6 to 7 inches as the largest top diameter. Some birch props are also cut in Norway and exported to the United Kingdom, where they are used for bobbin stock. Birch props must therefore be of better quality than pine and spruce props.

SQUARE HEWN TIMBER.

The United Kingdom is the principal market for hewn timber, and pine is preferred. Square hewn timber must not show any discoloration, rot, large knots, or defects which would materially impair the strength of the piece. The timber is cut on the half foot, and ranges in length from 14 feet up to about 34 feet. The timber is given a conical shape, the top being of smaller dimension than the butt. For instance, on a 25-foot timber the difference in the square between the butt and the middle of the timber may be 2 inches and between the middle and the top 3 inches. About 65 to 75 per cent of the length of the piece must be square edged, and the wane must not exceed three-fourths of an inch on the remainder.

Small hewn and sawn timber up to 9 inches square is mainly shipped to Germany and to the United Kingdom. The form of the small hewn timber is conical and the difference in the square at the butt and the middle must not exceed 1½ inches and the difference of the square at the middle and the top must not exceed 2 inches. The average length of this stock is from 14 to 18 feet.

OFFICIAL MEASURING OF WOOD FOR EXPORT.

Prior to 1892 the Norwegian exporters of props and round timber were often in a very unsatisfactory position when disputes arose over the measurement of cargoes to foreign countries. As the exporters had no association at that time which could take up matters of this kind on behalf of its members, they generally had to submit to the decision shown by tally in the port of discharge.

These circumstances were very unfavorable, because the wood was not paid for until it was tallied, and the importers frequently showed neglect in storing the wood in the ports of arrival, and before the cargoes were tallied they were often pilfered. As a consequence, the tally at the port of discharge would often show a discrepancy when compared with the tally in the port of loading. Furthermore, the exporters often had to wait a long time before they received payment. Only under the most favorable conditions were reliable exporters allowed to draw for 75 per cent of the amount of the invoice and receive final settlement after the tally had been made at the port of discharge.

The Norwegian Government corrected these unfavorable conditions by instituting an official tally service. In 1892 the country was divided into several districts, and to each district was assigned a Government official in charge of the tallying of cargoes of wood for export. Definite instructions were also drafted by the Government in regard to the tallying and rejection of rotten and defective wood unfit for shipment. The charges for this service were very small and only covered the actual cost to the Government of the maintenance of the service.

The importers have also learned to value this service, and ever since 1892 it has not been necessary to have any other tally, as both buyers and sellers abide by the decision of the Norwegian Government inspector.

For sawn and planed lumber there has been no need of an official tally, because it is a simple matter to obtain an accurate check on sawn and planed lumber, whereas the measuring of round timber, props, etc., may be effected in so many ways that disputes often arise without inferring that any willfully dishonest practices have been carried on.

It seems that the good results obtained in this regard by the Norwegian shippers could well be considered in the United States, not only for round logs, but also for sawn and planed lumber if necessary. It must be noted, however, that the Norwegian Government has not assumed any responsibility in regard to the quality of the shipments, but merely certifies to the measurements.

The advantage to both buyers and sellers is apparent, because the official tally eliminates all doubt as to the correct measurement of the

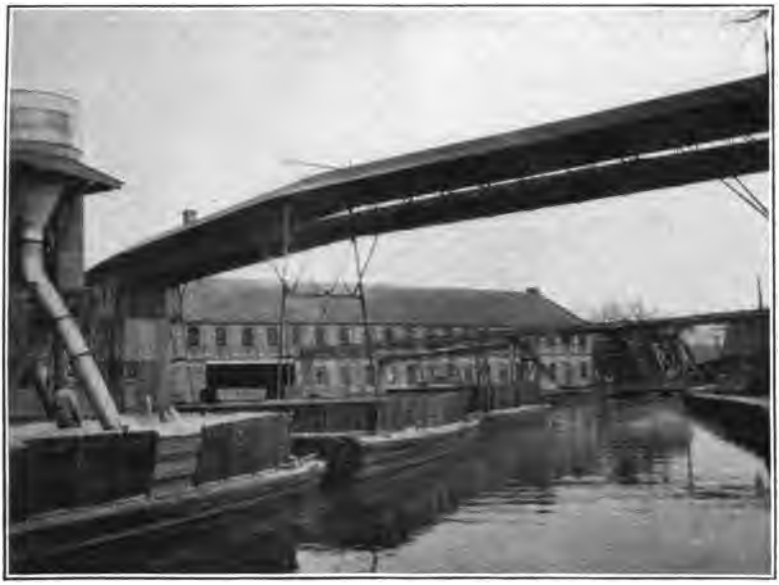


FIG. 44.—EXPORT SAWMILL SHOWING CONVEYER SYSTEM FOR LUMBER FROM MILL TO YARD AND BARGES LOADED WITH SAWMILL REFUSE.

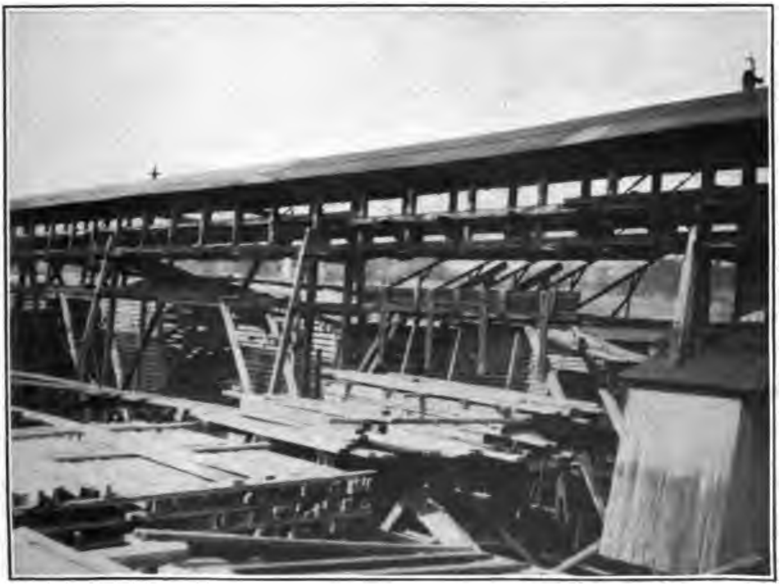


FIG. 45.—CONVEYER SYSTEM FOR LUMBER FROM MILL TO YARD.

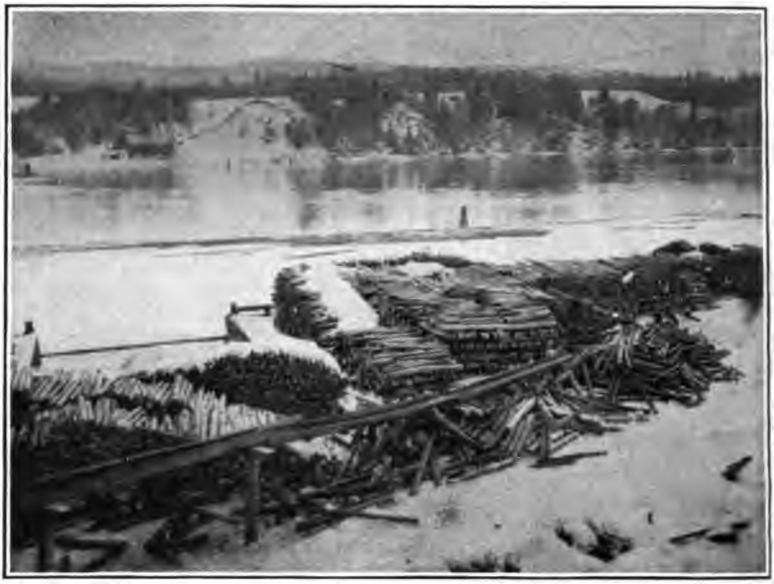


FIG. 46.—PROPS READY FOR SHIPMENT.

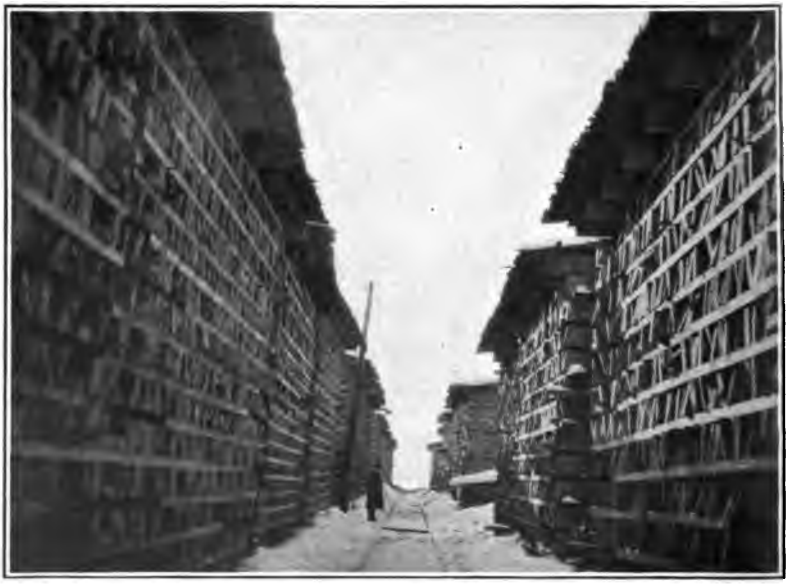


FIG. 47.– LUMBERYARD.

cargo and greatly facilitates the selling of the shipments, particularly in far-away countries where it would be difficult to check the final inspection at the port of discharge.

SHIPPING CONDITIONS.

The ability of the Norwegian lumber exporters to place their lumber in all five continents of the world is largely dependent upon the important national merchant marine and the excellent shipping conditions at all the Norwegian ports, which are open the year round. Furthermore, the export mills in general have taken a very active interest in the shipping question, and more so than the lumber exporters of any other country. A great many export mills have their own vessels and others are in some way directly interested in shipping companies.

The tendency in Norway has been for some years past to operate a service of regular steamship lines between Norwegian ports and the ports of the principal markets for Norwegian products. Immediately before the war Norway was thus connected with practically every important lumber importing country on the globe by direct Norwegian-owned steamship lines or by foreign lines cooperating with Norwegian steamship lines. For instance, the Swedish transoceanic liners would touch the southeastern ports of Norway and the Norwegian liners would in return touch the west coast ports of Sweden, thus enabling the two countries to maintain a very effective steamship service. There was also similar cooperation with other countries.

The southeastern ports of Norway offer the best shipping conditions and the bulk of the lumber exported from Norway originates in these regions. During the war a great many of the steamship routes were temporarily discontinued, but nearly all of them have now been restored, and other new lines and routes have been established. In the future this steamship service will be still further developed.

The southeastern ports of Norway now have direct steamship connections with the following lumber-importing markets: United Kingdom (east and west coast and Irish ports), Denmark, Germany (North Sea and Baltic ports), Holland, Belgium, France (Channel, Bay of Biscay, and Mediterranean ports), Spain (Bay of Biscay and Mediterranean ports), Portugal, Italy, Balkan Peninsula, Asia Minor and other ports in the Levant, Egypt and other North African countries, Canary Islands, West Africa, South Africa, East Africa, Gulf of Persia, British East Indies, Siam, Dutch East Indies and other parts of Asia, Australia, South America (east and west coast), Central America, and some other markets of less importance.

FREIGHT RATES.

Most of the lumber shipments from Norway are made in parcel lots and lumber is often shipped as deck cargo. Before the war opportunities were often presented to ship lumber at very low rates to complete cargoes, and this circumstance largely explains how the Norwegian lumber exporters have enjoyed extraordinarily cheap rates. The larger lumber exporters frequently made contracts extending through long periods of time with steamship companies operating direct liners between Norwegian ports and foreign markets and providing for shipments of lumber to complete cargoes. Such contracts were usually made for space to the United Kingdom, where there always was a market for Norwegian lumber. The lumber exporters were also generally able before the war to secure very cheap rates on full-cargo lots to Australia, South Africa, and other faraway countries.

It is with surprise that one hears that a rate as low as $3.07 per thousand feet was paid on one occasion by a Norwegian lumber exporter for a shipment by sailing vessels from southeastern Norway to Australia, a distance of 13,000 miles.

The following schedule gives prewar rates for rough and planed lumber from the southeastern ports of Norway. This schedule may not give the exact relation between the freight rates from Norway to the different markets, as this list has been compiled from information received from a great many shippers. Although these rates may not be of any particular interest at the present time, because the prewar level will likely never be reached again, it may serve to explain how it has been possible for Norwegian lumber to find its way to the various markets of the world. The rates are quoted in dollars per thousand board feet.

United Kingdom:	
Leith and Newcastle-on-Tyne	$2.15–$2.45
London	2.75– 2.95
Garston (Liverpool)	2.95– 3.10
Other west coast ports	3.70
Irish ports	4.30
Holland: Rotterdam	2.45
Belgium: Antwerp	1.95– 2.05
France:	
Channel ports	2.95– 3.40
Bay of Biscay ports	3.40
Spain:	
Bay of Biscay ports	3.90– 6.35
Mediterranean ports	6.85– 7.80
Portugal: Oporto and Lisbon	5.00– 6.35
Levant: Greece, Asia Minor, etc	7.40– 9.85
North Africa: Egypt, Algiers and Morocco	7.40– 8.60
Canary Islands	4.90
West Africa: Dakar	9.75
South Africa:	
Cape Town, Algoa Bay, and East London	8.00
Durban	8.90
East Africa:	
Delagoa Bay	9.20
Beira	10.50
Persian Gulf ports	12.30
British India: Calcutta and Bombay	11.05–13.50
Dutch East Indies	12.30
Australia:	
Melbourne, Sidney, and Adelaide	8.00
Freemantle	8.60
South America:	
Brazilian ports	11.00–14.00
Buenos Aires	9.50

Deck cargoes to some of the far-away countries were usually shipped at two-thirds freight rate. When lumber was shipped in full-cargo lots frequently as much as 30 per cent was taken on deck.

To other countries full freight was generally paid for deck cargoes or they were carried at a reduction of about 30 cents per thousand feet. Stowage (short lengths) 6, 7, and 8 feet in length was shipped at two-thirds freight rate in quantities not exceeding 3 to 5 per cent of the total cargo. For quantities above 3 to 5 per cent full freight was paid.

Before the war there was only a slight difference in freight rates at the various ports of southeastern Norway. This difference seldom exceeded 25 to 49 cents per thousand feet. Lumber from ports in the Trondelagen district was shipped at rates 49 to 92 cents higher than from ports in southeastern Norway.

OCEAN RAFTING OF LUMBER.

After the successful rafting of lumber in Sweden a similar attempt was made in Norway during the winter of 1918-19 on the Trondhjem Fiord. In regard to this rafting, a representative of the British Ministry of Shipping writes as follows:

> In the rafting of timber [lumber] from Hommelvik, Norway, to Ipswich, England, during the winter of 1918–19 a large timber raft was constructed at Hommelvik by a London timber firm. As the British Ministry of Shipping was greatly interested in this venture, and the arrival of the timber in England being of great importance, they gave their every aid to help the venture along and to make it a success. I was sent over to Norway last October by the Ministry of Shipping (London) to superintend the construction of the proposed raft. On arrival in Norway I picked out the site for building and also made all arrangements for labor. The raft was built on shipways, launched, and then towed over to England. I made the trip over the North Sea for the purpose of watching the movements of the raft in heavy seaways. Very rough weather was experienced. However, as the raft "worked" very well, we made the east coast without mishap. I was in charge of the unloading of this raft at Ipswich, and was therefore in a position to see the results of the timber having been submerged for three months, and also the amount of damage caused by the movement of timbers during heavy seas.
>
> The raft was 360 feet long, 42 feet beam, and with a depth of 18 feet from top to bottom. The raft consisted of a cargo of 1,242 standards (2,459 M feet b. m.) of sawn timber of various dimensions. The raft was constructed something like a ship, with a bow and stern; a rudder was used for the purpose of aiding the tugboat to maneuver the raft through the winding Norwegian fiords.
>
> In the construction of the raft a quantity of steel bolts were used for the purpose of strengthening the construction and to give added strength seaway. Compressed-steel springs were used ever 10 feet along both sides and down the center of the raft. These springs allowed the timber to swell without doing any damage to the strength of the construction; also allowed for the working of the raft in a heavy seaway.
>
> When the raft had been completed a tug towed her over to Ipswich, England. The trip took over 28 days, a considerable delay being caused by being held up in the Norwegian fiords waiting for favorable weather on the North Sea.
>
> During the trip over the North Sea a big storm was encountered. During this storm the raft went through very heavy seas, and she twisted and turned and looked more like a huge snake than anything else, and it was thought that the raft would never come through. However, the springs served right up to their purpose and allowed the raft to strain itself without doing any material damage. Later, when in quieter water, you would never have known that there had been any strain on the raft.
>
> On arrival at Ipswich the raft was inspected by representatives from the Ministry of Shipping and also by the firm who was responsible for the construction of the raft. Everyone expressed his opinion to the effect that it was certainly a wonderful piece of work and a credit to those who had built it.
>
> It took two weeks to unload this timber with the aid of two 5-ton electric cranes and a good-sized gang of men. Most of the timber came out in very good condition and was immediately stacked for the purpose of allowing the

> sun and wind to dry it out. Some of the timber was rather badly soaked with the salt water. However, as the timber could be used to advantage in foundation work, it was not considered that any material damage had been caused by the salt water.
>
> The steel bolts were sent away to be cleaned and strengthened and made ready for another raft. As this raft was a success, it is thought that many more rafts will be built, and in this way England and France will get a great supply of timber in short time for rebuilding purposes.

The expense of rafting from Norway to England was said to be only 50 per cent of the freight charged by steamers.

MARINE INSURANCE.

The prewar insurance rates for steamer cargoes from the east coast of Norway were about as follows: To United Kingdom, east coast and canal ports, one-fourth per cent; west coast and Irish ports, three-eighths per cent; French ports, Spanish Bay of Biscay ports, and Portuguese ports, three-eighths per cent; Canary Islands, one-half per cent; Mediterranean ports and Levant, six-tenths to seven-tenths per cent; South African ports, six-tenths to seven-tenths per cent; Australian ports, three-fourths per cent.

The rates for cargoes carried by sailing vessels were considerably higher. If, for instance, the rates for steamer cargoes to South Africa were six-tenths per cent, the rates for cargoes carried by sailing vessels would be 3 to 4 per cent; and if steamer cargoes to the United Kingdom paid one-fourth per cent for insurance, cargoes carried by sailing vessels would pay 1½ to 2 per cent.

The above rates are based on vessels classed as A1 and are average premiums for the entire year. Many exporters prefer to make contracts with marine insurance companies for the insurance of all cargoes shipped during each year at a certain average premium. Deck cargoes were insured at 100 per cent increase. To discourage the throwing overboard of deck cargoes, the underwriters insure deck cargoes separately. The premium paid for lumber in barges from the time it leaves the dock until it is loaded on board the vessel is generally about the same as that paid for cargoes carried by sailing vessels.

SHIPPING DISTRICTS.

The following table gives the export of planed and rough lumber and box shooks by shipping districts in 1913:

Shipping districts.	Planed lumber.	Rough lumber.	Box shooks.	Total.
	M feet b. m.	*M feet b. m.*	*M feet b. m.*	*M feet b. m.*
Fredrikshald	19,626	6,289	118	26,033
Fredrikstad	101,520	10,874	41,028	153,422
Christiania-Drammen	35,956	7,137	8,671	51,764
Skien	10,617	4,443	744	15,804
Christiansand-Kragero	1,115	26,860	358	28,333
Trondelagen	8,702	18,116	1,005	27,823
Other districts	162	274	....	436
Total	177,698	73,993	51,924	303,615

The most important shipping districts in Norway are located on both sides of Christiania Fiord. Starting on the Swedish border there are two important districts, the Fredrikshald and the Fredrikstad, where several large mills are in operation.

The *Fredrikshald shipping district* is conveniently located close to the Swedish border, and through a system of railways and canals is connected with important forest regions on both sides of the international boundary. Besides considerable quantities of planed and rough lumber, some mining timber and props and small quantities of round and hewn timber are shipped from this district. The quality of the shipments from this port is considered very satisfactory.

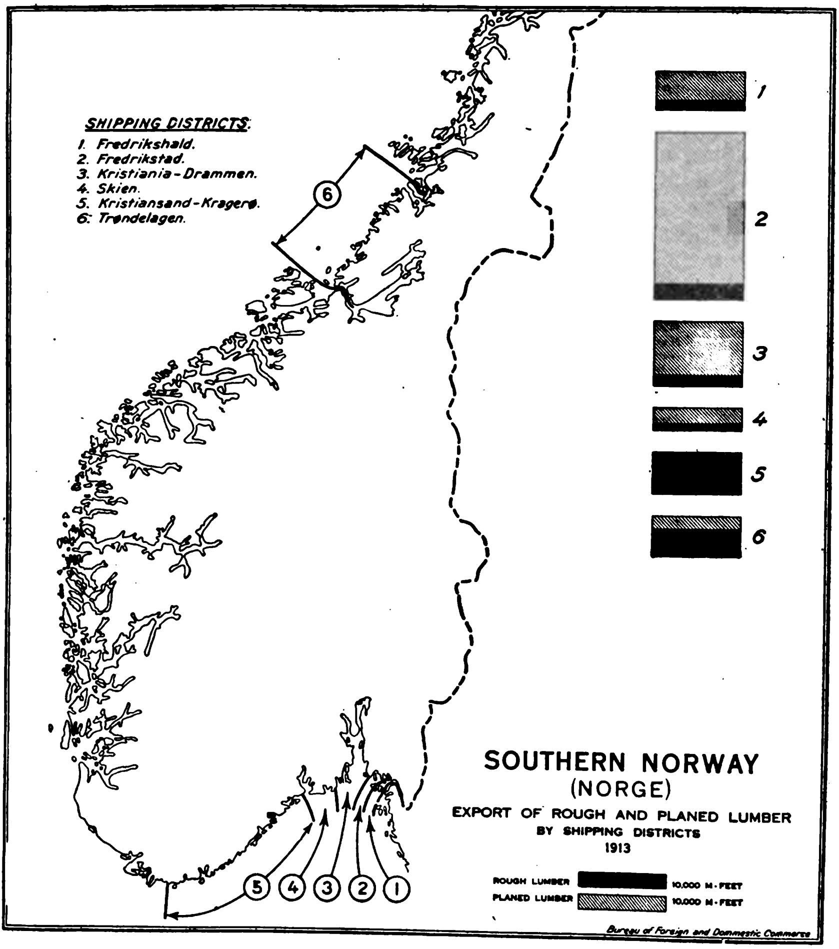


FIG. 48.—Export of lumber by shipping districts.

The *Fredrikstad shipping district* is the most important in Norway, shipping more than 50 per cent of the total quantity of planed lumber exported and almost 90 per cent of Norway's exports of box shooks. Fredrikstad is an important port for shipping rough lumber, although it constitutes less than 10 per cent of the total quantity of lumber exported from this port. The Fredrikstad district is one of the few districts in Norway where the lumber industry is conducted on a large scale. The mills are efficiently managed and are all of fairly large capacity, up to 40,000,000 board feet.

The shipments from the Fredrikstad district are considered to be among the best in Norway, as most of the logs are taken from the eastern interior districts bordering the Glommen River and its tributaries, where the best timber stands are found. The mills in this district have, however, taken lumber from other districts in Norway and have even barged lumber across the Christiania Fiord.

Some of the enterprising mills in the Fredrikstad district before the war took considerable quantities of lumber from the Baltic Provinces of Russia. This lumber was resawn and planed by the Fredrikstad mills and reexported. Large quantities are also exported via Fredrikstad from the adjacent sawmill districts in Sweden, particularly from the regions bordering Lake Wenner.

Fredrikstad has splendid shipping facilities, as it is located in one of the most densely populated districts of Norway, where many manufacturing establishments are found. The direct liners from southeastern Norway and western Sweden to foreign countries generally touch this port. This is no doubt the most promising sawmill center in Norway, because it is located at the mouth of the most important floating river and right in the center of a manufacturing district, which insures a ready market for the waste material, such as sawdust, and other sawmill waste that is sold to pulp factories. This is of essential importance in Norway in order to carry on the sawmilling in a profitable way.

Limited quantities of props and mining timber are also exported from this port.

The *Christiania-Drammen shipping district* embraces a great many smaller mills in the vicinity of Christiania. Most of the lumber for export is planed. Some quantities of box shooks, besides planks, battens, and boards of rough stock, are also shipped. The character of the shipments varies a great deal. Some mills ship excellent stock, but there are also a number of concerns of a speculative nature in this district that assemble lumber from smaller mills and export it without having adequate facilities for the handling and grading, and such shipments naturally can not be of uniform quality. Therefore shipments are not generally considered on a par with the shipments from the before-mentioned districts. Considerable quantities of mining timber and small timber are exported from this district. Through Christiania large quantities of Swedish stock are transshipped or reexported.

The lumber shipments from ports on the east side of Christiania Fiord have been decreasing in importance during late years on account of the rapid growth of the pulp and paper industry. Drammen is one of the oldest lumber-shipping ports in Norway, being located at the mouth of the Drammen River, an important floating river. There are some standard mills in the vicinity of this port, but the majority are small and the output of these small mills is not generally considered satisfactory, particularly because lumber not properly seasoned has at times been shipped from this port. Most of the shipments consist of planed lumber and box shooks.

The *Skien shipping district* includes several smaller sawmill districts in the vicinity of the Skien Fiord. There are some standard mills in this district but most of the mills are small. From the port of Larvik considerable shipments of planed lumber of excellent quality are made, while from the other ports in this district the exports consist chiefly of rough lumber, timber, telegraph poles, props, etc.

The *Christiansand-Kragero shipping district* is the most important in Norway for the shipment of rough lumber. The lumber from this district is generally coarse grained and shows a small percentage of heart. Considerable quantities of props and timber are also shipped. Shipments of planed lumber are not important. A great many mills are found along the coast, but they are all small, and the quality of the shipments is not on a par with that of most of the other districts. The western coast of Norway has only limited forest areas and does not even produce sufficient quantities of lumber for its own needs.

The *Trondelagen shipping district* has several shipping ports on the Trondhjem Fiord, mainly shipping rough lumber. There are some modern standard mills in this district. A large percentage of the lumber exported originates in Sweden and is taken by railroad to ports on the Trondhjem Fiord, where it is either reexported as rough lumber or manufactured into planing-mill products. The lumber from this part of the country is more square edged than that shipped from the southern districts and the quality is satisfactory, although the lumber is usually very knotty.

The Namsos sawmill district is included in the Trondelagen shipping district. Namsos is north of Trondhjem Fiord and is the northernmost lumber-export port of any importance in Norway. Some of the mills are of standard size and efficiently operated, and the uniformity of the output is satisfactory. The texture of the wood is very solid, but the lumber contains a large number of knots. The grading rules followed are similar to those of the Harnosand district in Sweden.

From the Trondelagen district considerable quantities of lumber are shipped to northern Norway and also to Iceland. North of this district the exportation of lumber is prohibited, except by special license issued by the Government.

TRANSSHIPMENT OF SWEDISH AND FINNISH LUMBER VIA NARVIK.

During the war the town of Narvik, located on 68½° north latitude, came into prominence as a transshipping point for Swedish and also for Finnish lumber. This port is the outlet for the products of the iron mines in the northern Provinces of Sweden, and a railroad, partly operated by electricity, connects this Norwegian port with the Swedish ports on the Bay of Bothnia.

During the war the Allies made shipments of considerable lumber via the port of Narvik, but the freight and insurance rates were so exorbitant that this route was later partly abandoned. The freight rates from the port of Lulea on the Bay of Bothnia to Narvik were on an average 32 cents per hundred pounds of lumber during the war. In addition to this rate there were also a number of extra charges which made the cost of these shipments almost prohibitive.

Narvik is located on a narrow strip of land and has high mountains behind it, so that the storage space available for lumber is extremely limited. There are practically no warehouse facilities, and the lumber had to be stacked in the open. The rent was very high and as much as 30 to 35 cents per square yard was frequently paid. For unloading railroad cars $1.30 to $1.50 per thousand feet was charged. On account of the limited facilities for handling transshipments of lumber in this port it is not believed that Narvik will figure prominently in the lumber export trade in the future.

There will always be some shipments of lumber from Sweden to Narvik, but hardly from Finland. Some Swedish lumber is distributed during normal conditions from Narvik to other districts in northern Norway.

A new Swedish railroad in course of construction will connect the Lulea-Narvik Railroad with the railroad from Central Norrland in Sweden to Trondelagen. This new railroad will run parallel with the Norwegian-Swedish border, through some of the most important timber regions in Sweden. It is possible that another railroad may be constructed in the future connecting the railroad now being built with some of the Norwegian ports between Trondhjem and Narvik. Such a railroad may offer a more satisfactory outlet for Swedish wood products via Norwegian ports than by shipping via Swedish ports on the Bay of Bothnia, which is frozen during part of the year. There are no definite plans under way for such an enterprise, but the question has come up lately in connection with the exploitation of the Swedish forests in the northernmost Provinces of that country.

NORWEGIAN LUMBER EXPORT ASSOCIATION.

In order to improve upon the unsatisfactory price level of planed lumber, the Norwegian exporters of this commodity established an association in 1892. At the start this association comprised only exporters of planed lumber, and was called the Norwegian Planed Lumber Export Association.

In 1917 this association was reorganized and was designated the Norwegian Lumber Export Association. The new association was divided into three branches, namely, the planed lumber exporters' group, the box shooks exporters' group, and the rough lumber exporters' group. Almost all the larger export mills are members. The shipments by the members now represent about 90 per cent of the total export of lumber from Norway.

In Norway there has been less price cutting among the shippers than in the other northern European lumber-exporting countries, because the advantageous geographical position of Norway has always enabled the exporters to more easily dispose of their products. Only during serious crises has it been necessary for the members of this association to mutually agree to curtail their production in order to stimulate the prices.

While before the war it was not necessary to establish minimum prices, the situation became quite changed during the war. The cost of labor and material increased to such an extent that the exporters had to assume a very firm attitude in their dealings with the foreign importers in order to make any profit. It is generally believed that there was an agreement between the Norwegian lumber exporters during the war to maintain minimum prices, following the example

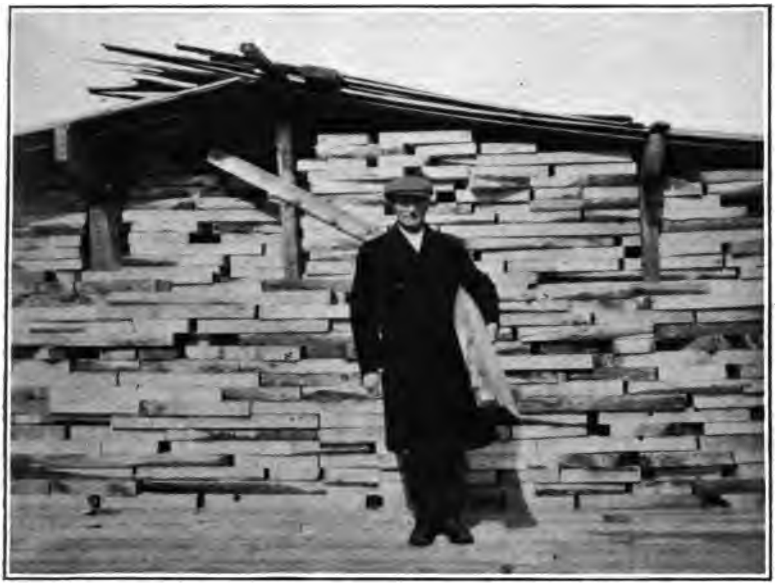


FIG. 49.—MILL ENDS USED AS RAW MATERIAL FOR BOXMAKING.

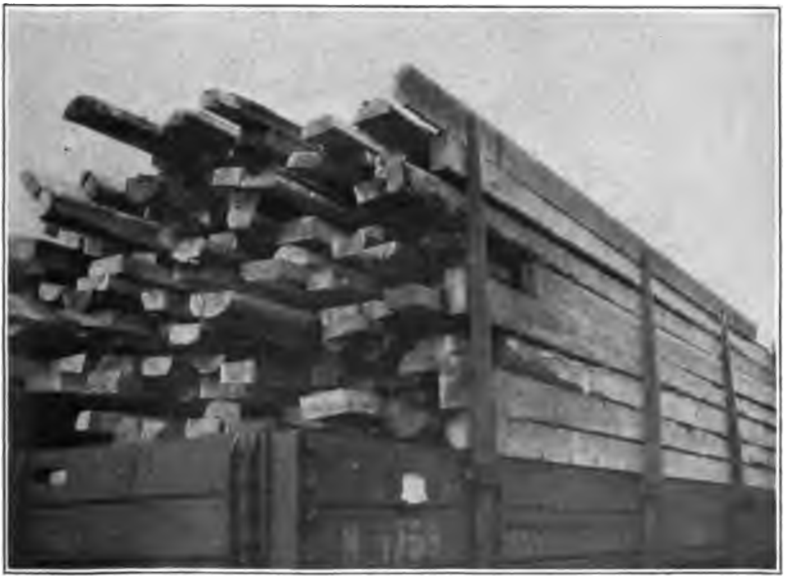


FIG. 50.—WANEY STOCK FOR PLANING MILLS.

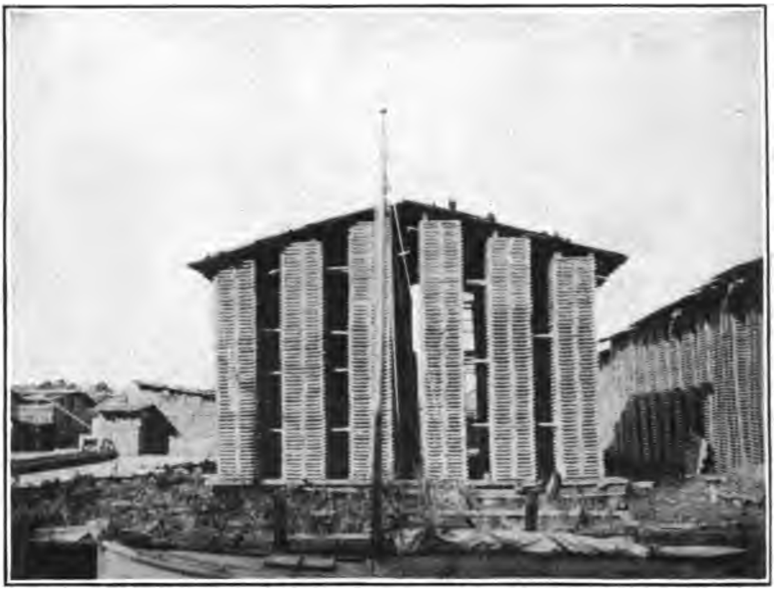


FIG. 51.—PILING OF STAVES.

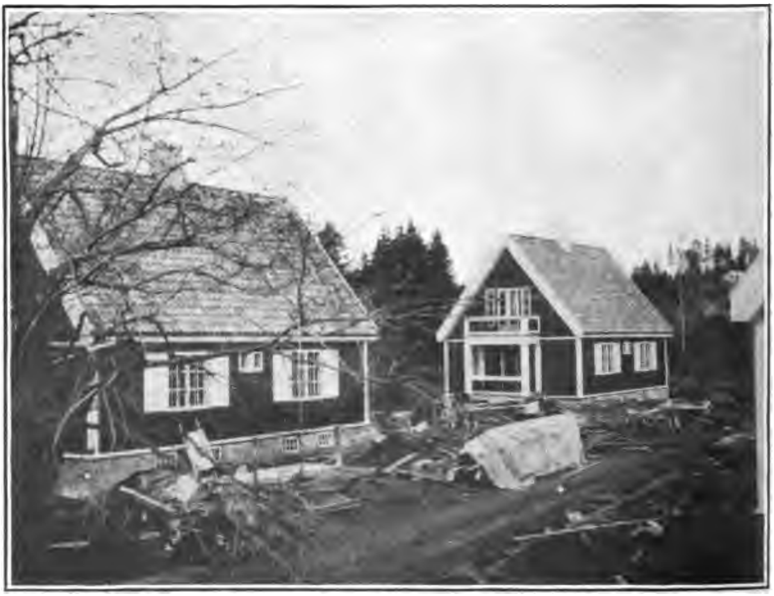


FIG. 52.—WORKMEN'S HOUSES OF READY-CUT TYPE.

of the Swedish exporters. This step was natural from their standpoint, because the buying for the Allies, who were practically the only importers of Norwegian lumber during the war, was in the hands of the British timber controller, and without a firm selling policy on the part of the Norwegian exporters it would have been easy to lower the prices below the level of the cost of production.

The Norwegian Export Association cooperates with the Swedish Lumber Exporters' Association by exchanging data, statistics, market reports, etc. There is, however, no stipulated difference of prices between the Norwegian and Swedish lumber for export, as is the case with Finnish and Swedish lumber. The small quantities exported from Norway would hardly cause any disturbance on the market, even if it were sold at somewhat lower prices, but generally the Norwegian exporters obtain better prices than the Swedish exporters on account of the better shipping facilities.

The association has also established a standard contract upon which its members buy their requirements of raw material for their planing mills and box factories, but the members compete in regard to prices. Standard schedules of profiles for planed stock for export have also been established through the association.

The Norwegian Lumber Export Association is not of very great importance and can not be compared with the Swedish Lumber Exporters' Association, which has taken up a great many other matters besides the question of prices. The association does not publish a magazine, but the members are kept informed in regard to matters of importance by circulars.

HANDLING OF LUMBER EXPORT SALES.

Although the Norwegian export mills are not generally as large as the mills in Sweden, the exporters in Norway are very particular to place the handling of their export business in the hands of capable sales managers. The management of the mill and the selling of the output are not usually intrusted to the same person. The sales managers of the larger companies are well trained and have usually spent several years abroad in the offices of lumber importers and lumber agents in order to acquaint themselves with the foreign methods of doing business and the different market requirements.

The sales managers are frequently given an opportunity to visit the customers abroad and the exporters and the importers are usually in close touch with each other. The favorable location of Norway within a short distance of the principal markets has removed many difficulties which other countries at a greater distance from the importing countries have to face.

Not only do the importers have a good idea of the Norwegian lumber industry as a whole, but they also know how to differentiate between the character of the shipments of the various exporters. The Norwegian exporters therefore maintain their own standards of grades, with which the importers are familiar. Importers desiring close-grained stock, for instance, know where to obtain this, and in cases where waney stock would be desirable the importers also know where such stock may be purchased.

Besides the selling of lumber, the exporters generally maintain a special branch activity devoted to shipping and insurance. As previously mentioned, many exporters in Norway have their own vessels. The lumber is usually sold on a c. i. f. basis, and by this extra effort to accommodate the importers the Norwegian exporters have succeeded in realizing better prices than exporters in the neighboring countries, who generally sell on a f. o. b. basis.

Lumber for export may be sold by any one of the following methods: (1) Selling through a foreign agent on a commission basis; (2) selling through a domestic agent on a commission basis; (3) selling outright to domestic export merchant; (4) selling outright to other mills; (5) exporting to own organization abroad and distributing to wholesalers; (6) selling direct to importers abroad; (7) consigning lumber to foreign markets. These methods are generally the same as those followed in Sweden and have been extensively explained in the report of the lumber industry in that country.

Most of the Norwegian concerns sell their lumber through foreign agents on the same conditions as Swedish lumber, but an important percentage of the output, especially from the smaller mills, is sold through domestic agents. The domestic agents are generally reliable concerns, and either work on a commission basis or buy the lumber outright and sell it for their own account. In the latter case the domestic agent may be classed as an export merchant.

In a country like Norway, where there are a great many small mills which generally are unable to handle an export business efficiently, on account of their inability to maintain a competent selling force, it is often desirable to sell through a domestic agent. There are a number of export merchants, some of whom handle lumber and forest products exclusively, but the majority deal in all kinds of merchandise. Some of these merchants have their own ships. They make up cargoes consisting of different commodities, and lumber is usually taken on to complete the cargo, whereby cheap rates may be obtained. Some of these export merchants maintain branches in the most important foreign ports and have established adequate services for the handling of lumber cargoes. The export merchants purchase the lumber outright from the mills and in many cases have their own brands.

Some enterprising Norwegian lumbermen have established their own selling organizations abroad. More than 60 years ago a start was made in southern Europe, where a Norwegian company was established. This concern developed rapidly and is now occupying one of the most important positions in the lumber import trade of that part of Europe. Other lumbermen have followed this example, and there are several companies operating importing organizations in North, South, and East Africa and Australia. Although some of these companies are not now operated by the mills in Norway, the owners sometimes have interests in several lumber companies in Norway, Sweden, or Finland.

The following up of sales of lumber abroad is worthy of a great deal of comment, as it is undoubtedly the most efficient way to further the lumber export trade. An exporter whose activities cease when the lumber leaves his dock is hardly worthy of the name "exporter" in its modern sense, because to efficiently handle lumber for export a great deal of supervision and active exploitation abroad are required.

Lumber is not often sold direct to foreign importers, because the Norwegian lumbermen have had the same experience as their colleagues in Sweden in regard to the valuable service rendered by agents who perform their duties in a conscientious way.

Some of the larger mills at times purchase lumber from other districts and mix it with their own. Lumber exporters in some ports for some reason or other, may not have as good a reputation in regard to quality of their stock as shippers in near-by districts. This may often be due to prejudice, but advantage is sometimes taken of this circumstance by shipping the stocks via other ports.

The selling is not confined to any specific time of the year. Stock lists of planed lumber are usually not sent to the agents, as almost any stock of this kind can be produced on short notice. Norway is frequently called upon to fill rush orders because of the ability to ship the year around. Norwegian exporters must be on the alert to sell their stocks when the market is most favorable, mainly during the wintertime, when practically no shipments are made from Russia, Finland, and the Bay of Bothnia ports of Sweden. There is not a great deal of cutthroat competition among the Norwegian importers, as they all understand the necessity of placing what small quantities of lumber they have to best advantage.

Overproduction of lumber very seldom occurs, but in a few cases when it was believed that the market conditions would be unsatisfactory the mills curtailed their production by mutual agreement.

Although the quality of the Norwegian lumber generally may be somewhat inferior to Swedish lumber, the Norwegian exporters, through favorable shipping conditions, usually obtain better prices for their production than the Swedish exporters. At any rate, the Norwegian lumber is seldem considered as the cause of lowering prices in the foreign markets.

CONSIGNING OF LUMBER TO FOREIGN MARKETS.

The consigning of lumber is at times practiced and this method was used during the war. It must be kept in mind, however, that consignments have mainly been made to the United Kingdom, where there always is a market for Norwegian stock, and the consignors are able to deliver their goods in England almost immediately after notice has been received of favorable market conditions for such shipments. Consignments from Norway, therefore, are not subject to such risks as consignments from far-away countries. Furthermore, the mills do not dump the lumber irrespective of market conditions, but usually restrict their consignments to periods when the prospects for sale are satisfactory. With satisfactory shipping conditions and the frequent opportunities for obtaining low freight rates, the exporters may avail themselves of these conditions to make consignments.

During the war many shippers consigned lumber to the United Kingdom, and as the market was steadily rising the consignors were in almost every case able to make very satisfactory profits. It can not be denied that the consigning of lumber during normal conditions is looked upon with disfavor by most of the shippers, and it is estimated that during normal times probably less than 3 per cent of all lumber exported from Norway is shipped on consignment.

Lumber for consignment is usually branded, unless the stock is defective. The prices obtained at auction sales in foreign countries may be satisfactory when the brands are well known, but the expenses for storage and handling are often heavy, especially if the lumber has to be stored for some time to await more favorable market conditions.

A large percentage of the cargoes consigned consists of odds and ends left on hand after each shipping season, such as odd sizes, scant stock, or other defective lumber. It is illustrative of the views held in Norway, Sweden, and Finland by the lumber exporters in regard to consignments that they all accuse each other of spoiling the market by consigning lumber.

The Norwegian shippers, like the Swedish and Finnish, enjoy an excellent reputation for honesty and integrity in their dealings. Although the export mills in Norway have been working with limited financial resources, failures have been so rare that they may be left out of consideration. The mills are very conservative in accepting orders, and do not undertake to supply lumber in excess of the quantities which they are certain of being able to produce. Some mills may buy lumber from other mills in case of emergency, but this is not a common practice.

SPECULATIVE LUMBER PURCHASES DURING THE WAR.

During normal times there is very little speculating in shipments, and in consequence the lumber export trade has for years rested on a very sound basis. Unfortunately for the Norwegian exporters, the scarcity of lumber abroad and the high prices offered during the war induced a good many incompetent people to enter the lumber export business, often without any knowledge whatever of the lumber export trade. These new concerns would generally handle any commodities on which they might expect to make a profit, and a reckless speculation in purchasing material from smaller mills was carried on for months. As the demand for lumber was so large that the importer almost had to accept any kind of stock shipped this was an inducement for unscrupulous shippers to lower the grades. But it must be said to the credit of the old reliable mills that they did not deviate from the prewar grading rules or established business principles.

An extract of a statement received from one of the best-known lumber exporters in Norway in January, 1919, illustrative of the conditions during the war, reads as follows:

> It is a well-known fact that speculators and people who never were in the lumber business have appeared on the scene during the war time and assembled lumber cargoes, which they made up often from partly defective lots from small portable mills, and have sold this lumber at practically the same prices as the lumber shipped by standard mills exporting lumber in accordance with the established grading rules of their districts.
>
> These new concerns have constantly been speculating in advancing prices and have not lost an opportunity when the market went against them to take recourse to practices which have been a source of annoyance to reputable shippers. That these speculators have been able to make a profit on such cargoes can only be explained by assuming that the receivers of the cargoes have not had facilities for the proper inspection of these stocks, and consequently have not made complaints. It is easily understood that such procedure must have affected the standing of some of the other shippers in this country (Norway).

Several shippers who formerly closely adhered to the standard grading rules became lax, as no serious consequences would ensue. Toward the end of the war we thus find that the shipments from several Norwegian districts varied considerably in character and that only old and well-established mills were shipping in accordance with the prewar grading rules.

It has also been noticed that many cargoes have been shipped practically green, and such lumber naturally would discolor very easily. The lumber has frequently been poorly manufactured and miscuts have often been shipped in large quantities. Such lumber would have been the object of heavy claims before the war, but during the war it seems that such goods have, unfortunately, been accepted on par with well-manufactured stock.

Many of these speculators did not expect to sell more than one cargo, and they had no reputation to lose by making defective shipments. The reliable Norwegian shippers were not interested in these dealings, but such business has no doubt had a somewhat unfavorable effect upon the whole lumber export business of Norway. It is hoped that after the war, when such unscrupulous shippers have been weeded out, the reputation of the Norwegian shippers will be as good as it was before the war, and this weeding-out process, we believe, has already commenced.

CONTRACTS.

The contracts upon which lumber for export is sold are the same as those used in Finland and Sweden. The following two specimens are representative of f. o. b. and c. i. f. contract forms such as are usually employed by the Norwegian exporters:

(F. o. b. form.)

Sold to--

Bought of---

through the agency of--

the following wood goods of ----------- actual St. Petersburg standards of about the specification stated below for shipment at --------------------------- per--------------------------- by ---------------------------------------

1. The goods are warranted to be of fair average quality and manufacture of the sellers' usual shipment from port of loading and to be delivered to the ship in accordance with the custom of the port, the sellers not being responsible for any deterioration occasioned by circumstances beyond their control after goods have been sent alongside the vessel.
2. Ship room to be provided by buyers in due time before----------------- and charter to stipulate the customary number of weather-working days for loading. Buyers undertake that 6 clear days' notice for sailing vessels and 10 days for steamers be given to sellers direct before arrival of any craft to load under this contract, such notice stating vessel's and charterer's name.
3. A margin of 10 per cent more or less, but not exceeding 50 standards, to be allowed for convenience of chartering; but when several shipments are made under the same contract such margin to apply only to the quantity by the last vessel.
4. In case the shipment of any of the goods be delayed or hindered by war, ice, floods, drought, fire, strike, lockout, or any cause beyond the control of the sellers, they shall not be held responsible for any damages resulting to the buyers therefrom.
5. No claim will be recognized by sellers upon any goods shipped under this contract unless made within 10 days from date of ship's final discharge and before any portion is removed.
6. The prices are in British sterling per St. Petersburg standard of 165 English cubic feet nominal measure, f. o. b. for lengths 9 feet and up. Falling ends 6 to 8 feet at two-thirds price.

Basis, $\frac{5}{4}$, 1, $\frac{7}{8}$, and $6\frac{1}{2}$ inches nominal mixed red (pine).
$\frac{5}{4}$, 1, $\frac{7}{8}$, and $6\frac{1}{2}$ inches nominal mixed white (spruce).
10s. extra for $\frac{3}{4}$ inch.
20s. extra for $\frac{5}{8}$ inch.
20s. extra for weatherboards.
25s. extra for weatherboards chamfered and checked.
Thirds at a reduction of 15s.

7. Payment in London in exchange for bill of lading and other shipping documents in cash less 2½ per cent discount.

8. If the buyers do not charter in accordance with paragraph 2, or if the goods or any portion thereof should remain unshipped three months after the above-named date, it is optional with the seller to cancel the contract or to draw on buyers per 3 d/s ÷ 2½ per cent discount for the estimated amount of invoice, holding the goods for account and risk of the buyers, but sellers not being responsible for deterioration of the goods.

9. Marine insurance to be covered by buyers.

10. Should any dispute arise under the stipulations of this contract, impossible to settle by friendly arrangement, buyers shall not reject any of the goods nor refuse payment or acceptance of draft or drafts; but the dispute shall be referred to arbitrators, conversant with the species of wood in question, one arbitrator to be nominated by each party with power to choose an umpire whose award on all points shall be final. The expenses of this arbitration to be equally divided between sellers and buyers. The provisions of the arbitration act of 1889 shall apply to all arbitrations under this contract except in so far as they are inconsistent with the above stipulations. In case of the noncompliance by the buyers with any of the terms of this contract, sellers to have immediate power of resale at buyers' risk.

(C. i. f. form.)

Sold to____

Bought of____

through the agency of______________________________________

the following wood goods of__________actual St. Petersburg standards of about the specification stated below for shipment at______________________

1. The goods are warranted to be of fair average quality and manufacture of the sellers' usual shipment from port of loading and to be delivered to the ship in accordance with the custom of the port, the sellers not being responsible for any deterioration occasioned by circumstances beyond their control after goods have been sent alongside the vessel.

2. Prices are per St. Petersburg standard of 165 English cubic feet, nominal measure for lengths 9 feet and up. Falling ends 6 to 8 feet at two-thirds price.

3. Ship room to be provided by sellers.

4. A margin of 10 per cent more or less to be allowed for convenience of chartering, but when several shipments are made under the same contract such margin to apply only to the quantity by the last vessel.

5. In case the shipment of any of the goods be delayed or hindered by war, ice, floods, drought, fire, strike, lockout, or any cause beyond the control of the sellers, they shall not be held responsible for any damages resulting to the buyers therefrom.

6. No claim will be recognized by sellers upon any goods shipped under this contract unless made within 10 days from date of ship's final discharge, and before any portion is removed.

7. Prices are all in British sterling, cost, freight, and insurance to__________

8. Buyers to pay freight as per charter party and balance by approved acceptance payable London to sellers' or agents' draft at four months from date of bill of lading, or at buyers' option in cash less 2½ per cent discount, if such option is declared before bill of lading is signed, on receipt of and in exchange for shipping documents and a good policy of insurance.

9. Should any vessel chartered under this contract be lost previous to loading (and after having been named to buyers), sellers to have the option of canceling the contract to such an extent upon giving prompt notice to buyers, leaving, however, the buyers' option to take the goods at an equivalent f. o. b. price.

10. Should any dispute arise under the stipulations of this contract, impossible to settle by friendly arrangement, buyers shall not reject any of the goods nor refuse payment or acceptance of draft or drafts, but the dispute shall be be referred to arbitrators, conversant with the species of wood in question, one arbitrator to be nominated by each party with power to choose an umpire whose award on all points shall be final. The expenses of this arbitration to be equally divided between sellers and buyers. The provisions of the arbitration act of 1889 shall apply to all arbitrations under this contract except in so far as they are inconsistent with the above stipulations. In case of the noncompliance by the buyers with any of the terms of this contract, sellers to have immediate power of resale at buyers' risk.

The contracts may cover quantities as small as 40,000 feet board measure. The prices for such parcel shipments are higher than those for full cargo lots, but small shipments frequently caused a great deal of trouble.

In the lumber export trade the same standards of measurement are used as in Sweden and Finland. Sawn lumber is sold on the basis of the Petrograd standard, equal to 165 cubic feet or 1,980 feet board measure. Planed lumber is usually sold per Petrograd standard, the basis of the measurement being the rough sizes from which the planed stock was produced (adding one-eighth inch to the thickness and one-fourth inch to the width of each planed piece). Planed lumber is freighted on a basis of actual measurements, however. Hewn and round timber may be sold by the load, equal to 50 cubic feet, or per cubic foot, cubic meter, Petrograd standard, etc. The methods of measuring such stock vary considerably according to the country of destination. Props and split wood are usually sold by the cubic fathom, equal to 216 cubic feet.

BRANDING OF LUMBER FOR EXPORT.

The branding system is the same in Norway as in Sweden and Finland, and usually every piece of lumber exported is marked with the shippers' brand, indicating the name of the exporter and the quality of the lumber; also in some cases whether pine or spruce and the degree of manufacture. Even planed lumber is branded in Norway.

Following is a list of brands illustrative of the Norwegian trade-marking systems for lumber:

FREDRIKSTAD SHIPMENT.

Sawn lumber (pine and spruce):	
Mixed grade	A H K + C
Second grade	A H K + A
Third grade	A H K + T
Fourth grade	A H K + P
Fifth grade	A H K
Unsorted grade	K ♔ C
Planed lumber (pine):	
First grade	A H K + C
Second grade	A H K
Third grade	K K K
Unsorted grade	K ♔ C
Planed lumber (spruce):	
Mixed grade	W D + C
Third grade	G L I N G E

LARVIK SHIPMENT.

Sawn lumber (pine and spruce):	
Second grade	F W T
Third grade	T W F
Fourth grade	W × W
Fifth grade	+ + + +
Unsorted grade	T ★ F
Planed lumber (pine and spruce):	
First grade	F R I T Z Ø E
Mixed grade	F R T Z Ø
Second grade	F — Z Ø E
Third grade	Z Ø E
Unsorted grade	F R Z Ø

When the lumber is defective or if other conditions make it desirable not to divulge the name of the shipper, the exporters may not brand the lumber, but in such cases the prices will naturally be lower. Lumber not bearing the exporter's brand is often shipped on consignment.

TERMS OF PAYMENT.

Before the war it was not customary for the Norwegian exporters to extend credit to the importers. The usual practice was to draw on the agent for the full amount of the invoice, after having deducted the agent's commission and the cash discount, usually amounting to 5 per cent of the f. o. b. value of the cargo, and then to discount the draft at a local bank in Norway. Agents, on the other hand, might make arrangements with the importers in regard to the extension of credit, but this was a private arrangement between importers and agents in which the exporter was not concerned. In some cases the exporter might extend credit for a limited time to well-known importers.

Terms of payment for shipments to the United Kingdom were usually cash three days after sight less 2½ per cent discount or payment four months after date of bill of lading. The same conditions applied to British colonial markets.

The terms for shipments to France and Belgium were usually cash less 2½ per cent discount, 10 days after sight less 2 per cent discount, or four months after date of bill of lading.

To the German market lumber was usually sold on payment three days after sight or cash 10 days after date of bill of lading less 2 or 2½ per cent discount.

The conditions of payment for shipments to Holland and Denmark were generally draft payable three or four months after date of bill of lading or cash less 2 per cent discount.

During the war these terms were greatly changed, but it is believed that the prewar terms will be instituted again when conditions become more settled. Old, reliable importers have no difficulty in securing the same terms of payment as before the war, but the exporters show greater caution in their dealings with new or uncertain customers.

There appears to be a growing tendency to have the agents guarantee the solvency of their customers (del credere), and for this service a small commission is usually paid. This compensation is included in the above-mentioned 5 per cent commission.

It should be noted that the handling of Norwegian lumber shipments causes the agents very little trouble and work and that claims are easily settled. For these reasons the agents can afford to accept very low commissions for the handling of Norwegian as well as Swedish and Finnish stocks.

While the domestic agents in Norway to a great extent finance the smaller mills, it is not believed that the foreign agents make advances to the Norwegian mills or give financial support other than the arranging for credit to customers in cases where the exporters are unable to do this themselves. It is not believed that the Norwegian exporters will undertake to grant long-time credit to the importers, because the exporters' financial resources are not generally so ex-

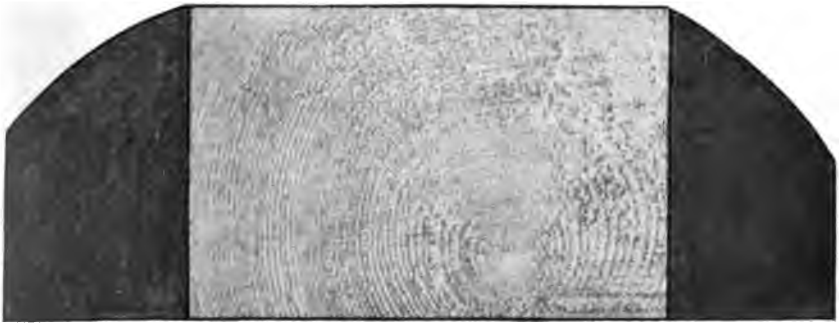


FIG. 53.—METHOD OF RESAWING WANEY STOCK.

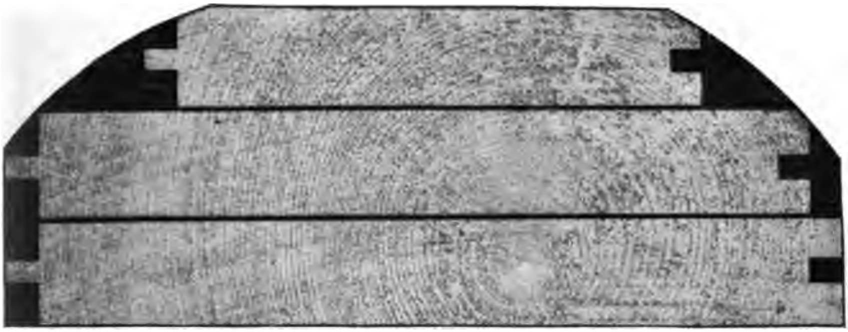


FIG. 54.—METHOD OF RESAWING WANEY STOCK.

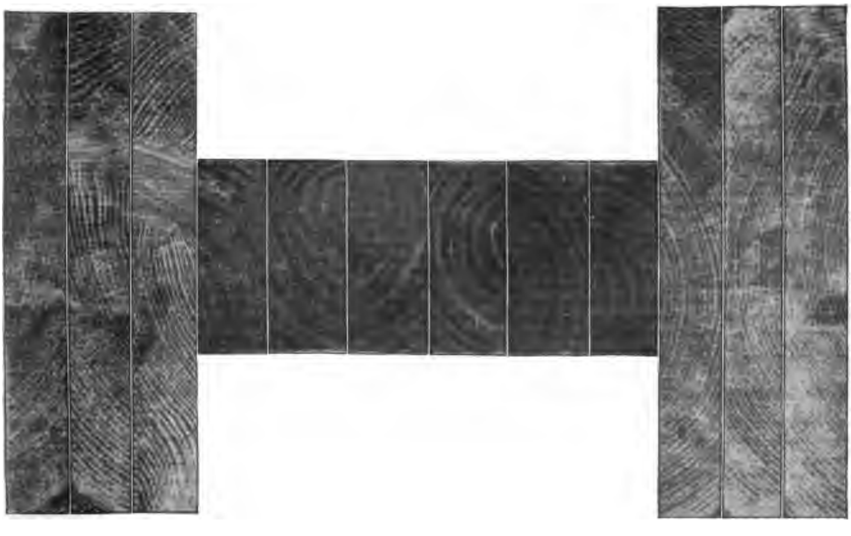


FIG. 55.—LAMINATED WOODEN BEAM BUILT OF SHORT PIECES OF LUMBER.

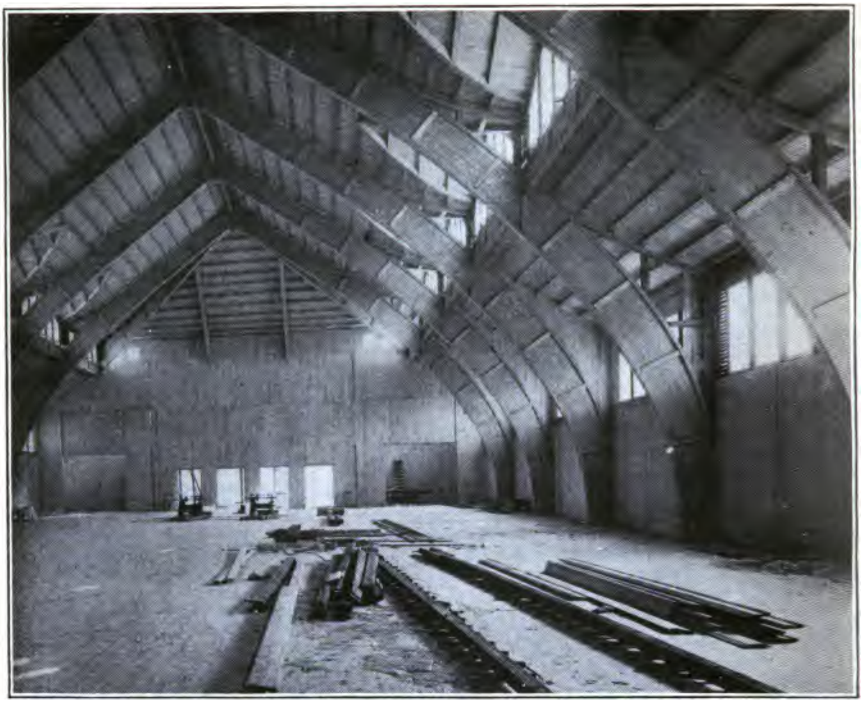


FIG. 56.—LAMINATED BEAMS BUILT OF SHORT LUMBER USED IN CONSTRUCTION.

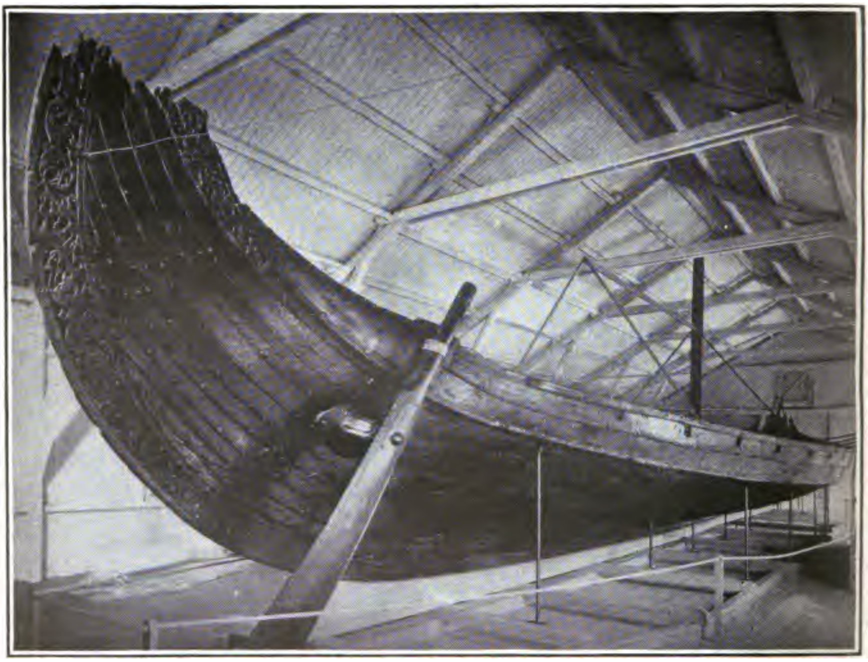


FIG. 57.—VIKING SHIP BUILT OF OAK MORE THAN 1,000 YEARS AGO.

tensive that this would be possible; furthermore, there will probably for years to come be ample opportunity to dispose of their stocks on favorable terms of payment without having to sell on credit.

PRINCIPAL MARKETS FOR NORWEGIAN LUMBER.

ROUGH LUMBER.

The following discussion of markets is based on prewar conditions:

The United Kingdom and Belgium together take more than 50 per cent of the small quantities of rough lumber shipped from Norway. France, Germany, Holland, and South Africa take most of the balance.

The dimensions are about the same as those shipped from Sweden and Finland, with the exception that wide stock (9 inches and up) is more difficult to obtain in Norway than in the other countries.

The United Kingdom takes almost all dimensions produced, both pine and spruce. Scantlings 2 by 4, 2 by 4½, 3 by 4, and 3 by 4½ inches are nearly always in demand, besides considerable quantities of pine battens, especially 2½ by 7 inches, and planks.

Belgium imports dimensions 2½ by 7, 2½ by 6½, 2½ by 6, 2 by 5, 2 by 4, and 1 by 4 inches. Pine stock is preferred.

Germany takes mainly spruce battens in dimensions of 2 by 7, 2 by 6, 2 by 5½, 2 by 5, 2½ by 7, 2½ by 6, 2½ by 5½, 2½ by 5, 3 by 7, 3 by 6, 3 by 5½, and 3 by 5 inches. Limited quantities of boards in thicknesses of 1 inch and 1¼ inches and in widths of 4, 4½, 5, 5½, 6, and 7 inches, both pine and spruce, are also taken.

Holland prefers spruce and is always in the market for 8-inch stock, which is not often sold to other countries. Battens 2½ by 6½ and 3 by 7 and 8 inches are most in demand, besides boards of 8-inch width.

South Africa takes pine planks 3 by 9 inches, with an average length of 17 to 18 feet, and limited quantities of scantlings. The lumber for this market must be seasoned with special care on account of the long passage and is generally cut more square edged than for other markets.

Other markets take only small quantities of rough lumber and are of practically no importance.

Staves are shipped mainly to the United Kingdom. Norway itself is a large importer of staves, which are used for fish barrels and containers for chemicals produced in Norway. Germany, Holland, and the Canary Islands also take small quantities of staves.

Although the Norwegian export statistics do not give the species of the lumber exported, it is believed that pine and spruce constitute at least 98 per cent of the total quantities.

PLANED LUMBER.

The Norwegian export statistics only specify "planed lumber of all kinds" and do not indicate either species or dimensions. It is, however, believed that the export of planed lumber of kinds other than pine and spruce is so small that it may be left entirely out of consideration.

The principal market for planed lumber is the United Kingdom, which takes more than 50 per cent of the total quantities shipped from Norway. This market seems to take almost any dimensions produced. It has generally taken Norwegian planed lumber in the unsorted grade.

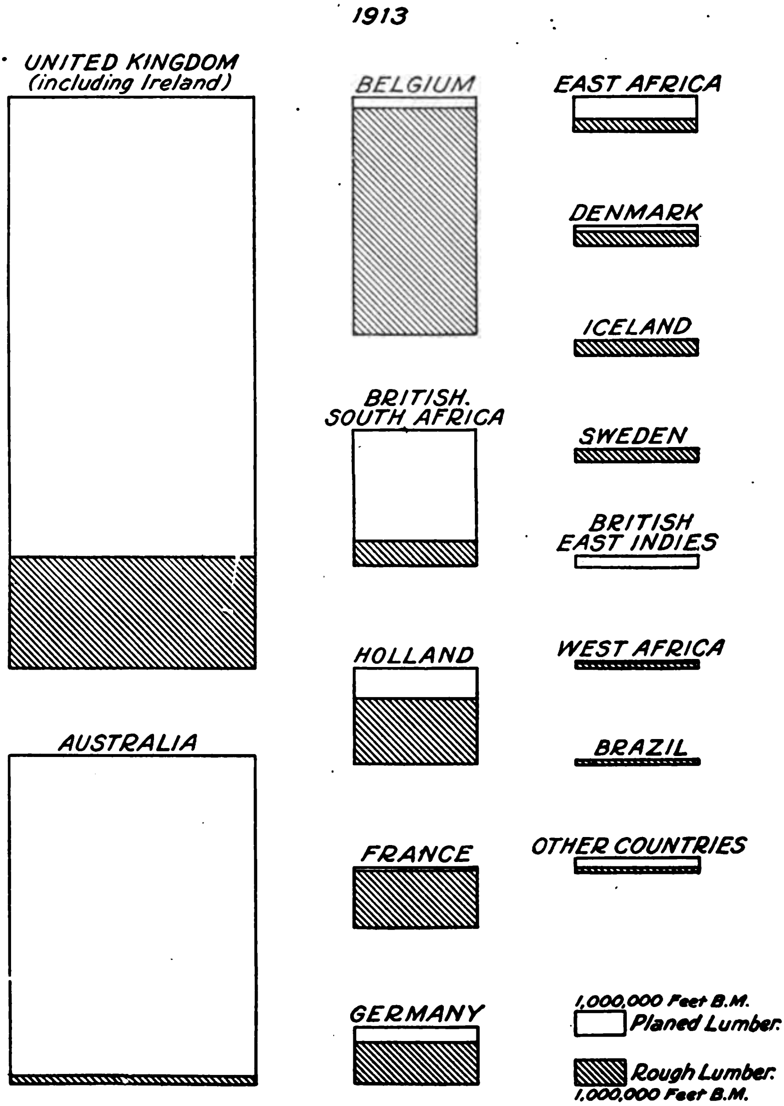


FIG. 58.—Norwegian exports of rough and planed lumber by countries.

Australia is the second largest market for Norwegian planed lumber and has been a growing market for a number of years. During normal conditions Australia takes 30 to 35 per cent of the export of planed stock from Norway. The principal dimensions are ½ inch, ¾ inch, and 1¼ inches for thickness and 6½ inches for width, both pine and spruce. Weatherboards 7 inches wide are also taken by this market. The lumber is furnished in colonial first and colonial third grades.

British South Africa is also a considerable market, although of much less importance than Australia, and takes from 5 to 10 per cent of the total output of planed boards for export from Norway. Pine stock in thicknesses of ⅝ and 1 inch, width of 6½ inches, tongued, grooved, and beaded, is taken in colonial first and colonial third grades.

Other markets of less importance are Holland, Germany, Portuguese East Africa, and British India. To British India special stock for tea shelves is shipped, 6½ inches in width and in thicknesses of ½, ⅝, ¾, and ⅞ inch.

BOX SHOOKS.

The United Kingdom is the largest market for Norwegian shooks, taking about 80 per cent of the total output for export. The Canary Islands also is an important market for banana and fruit crates. Other markets of less importance are Germany, British South Africa, Belgium. It is not possible to give any specifications, as these vary a great deal, even in case of the same customers.

PAVING BLOCKS.

Although close-grained Norwegian pine has been used to a limited extent for paving blocks in Norway, practically no efforts have been made by Norwegian mills to produce this article for export. It is believed that part of the mill ends of planks and battens shipped to the United Kingdom have in the past been used for paving blocks. At any rate, Norwegian pine is decidedly more suitable for paving material than, for instance, French Maritime pine, which is very coarse grained but extensively used for paving in many cities in Europe.

READY-CUT HOUSES.

Norway has for many years manufactured ready-cut houses, both for domestic use and for export. This industry is not very large, however, and the exportation of ready-cut houses has not been considerable, amounting to only a few thousand dollars a year before the war. The value of the exportation from 1910 to 1916 was as follows:

1910	$402	1914	Not given.
1911	724	1915	Not given.
1912	5,065	1916	$11,256
1913	3,538		

During the latter part of the war the ready-cut house industry increased its activities and a few new factories were started for manufacturing ready-cut houses on a large scale, mainly for export to the devastated regions of Europe.

The latest development in this line is the construction of sectional houses made up of frames which can be put together in such a way that the draft is eliminated. This is accomplished by a special joining device which is patented (Spörck-Haslund system). The advantage of this construction system seems to be that if a number of houses are to be erected, any possible missing section will not effect the construction of any but the last house, because all the sections are of standard size.

A considerable number of ready-cut houses were shipped to Italy some years ago after the Messina catastrophe. The Norwegian companies obtained some orders from the Allies during the war, shipping ready-cut houses to northern Russia. According to reports, these houses were considered satisfactory in spite of the severe climate.

It is apparent that Norway is prepared to take up the production of ready-cut houses on a large scale, if a sufficient demand should warrant such steps. The handicap in Norway is the high cost of raw material and labor, but these disadvantages are partly offset by the excellent shipping facilities. The largest company turning out ready-cut houses is capable of producing them at a rate of a million dollars worth per year.

A great many ready-cut houses have been recently constructed for the domestic market to relieve the shortage of dwellings. The Norwegian Government has constructed temporary offices of this type, and a great many of the new industrial concerns have put up workmen's houses of the ready-cut type.

PRICES.

Before the war prices of lumber for export from Norway were quoted in the currency of the country of destination—pounds, francs, marks, etc. It was not customary to stipulate a guaranteed rate of exchange in selling to countries having a stable monetary system. In countries where the rate of exchange fluctuated a great deal quotations were frequently made in francs, pounds sterling, or other currency of a more stable nature.

During the war the wide fluctuations in the rates of exchange and the losses which these caused made it necessary for the Norwegian exporters to follow the example of the Swedish exporters and establish a fixed rate of exchange for payment. After some opposition on the part of the importers, this arrangement went into effect during an early stage of the war.

The quoting of prices at a fixed rate of exchange has been maintained ever since the war and is likely to continue until conditions become more settled.

PRICES OF ROUGH LUMBER.

The quantity of rough lumber exported from Norway is too small to materially influence the market prices. The Norwegian lumber exporters, therefore, can not deviate greatly from the prices obtained in Sweden and other north European countries.

During the time when all ports in Sweden are able to ship, the quotations for Norwegian rough lumber are generally somewhat below those of the Harnosand district in Sweden. (These quotations are made the basis of all Swedish quotations.) This is due to the fact that the Norwegian stock is usually inferior in quality and sawn with a large amount of wane.

During the winter months—January and February—the Norwegian exporters obtain the best prices, ranging from $2.46 to $3.69

higher than the prices obtained by the Swedish exporters in the above-named district.

The Norwegian exporters are quick to sense an opportunity to obtain the highest possible prices for their products and keep an eye on a great many different circumstances—freight rates, immediate need of their stocks abroad, stocks on hand in other countries, ability to make shipments, etc.

Lumber from western Sweden of standard output is generally quoted at $1.23 to $2.45 per thousand feet higher than the average Norwegian waney stock. The Norwegians are satisfied with this small discount in price, because they claim that the saving in material effected through the sawing of waney stock amply recompenses them for this lower price.

Shipments from the northernmost shipping districts in Norway are quoted at somewhat lower prices than those from the southeastern ports. The difference ranges from $0.61 to $1.23 or more per thousand feet, and is merely the difference in freight rates, because the quality of the lumber from the north may in many cases be better than that of the shipments from the southern districts.

These prices do not refer to Swedish lumber reexported or transshipped through Norwegian ports. This lumber is usually of better quality, is sawn almost square edged, and commands higher prices than the Norwegian stock.

Schedules of prices for the various dimensions are not fixed and vary a great deal. The Swedish schedules are generally adhered to. During the war these schedules were greatly changed. There was a time when practically no attention was paid to the width of the stock and cargoes were sold on a lump-sum basis, thus giving the shipper considerable latitude in filling the orders.

There are no data published in regard to the average prices of rough lumber exported from Norway, but reference is made to the table on page 119 showing the average prices of planks, battens, and boards as they appear in the official export statistics of Norway.

Attention is called to the fact that the Norwegian rough lumber for export is different from the waney stock supplied to the local planing mills.

PRICES OF PLANED LUMBER.

The principal interest is always concentrated on the prices of planed lumber, as this constitutes the largest part of lumber exports from Norway. Relatively, the Norwegian shippers obtain much better prices for planed stock than for rough stock. The Lumber Exporters' Association has established a fixed scale of prices covering the various dimensions, grades, and profiles of planed lumber for export. These schedules, however, are often changed to follow the markets.

The basis upon which planed lumber is sold is 1¼, 1, and ⅞ by 6½ and 7 inches, surfaced four sides. The prices are generally quoted for first-quality pine and mixed-quality spruce. During the war a change was made in this respect, whereby most of the shipments of planed lumber, both pine and spruce, were made in the unsorted grade. This basis is likely to be maintained in the future.

When planed lumber is sold graded into three grades, the price relation between these grades is as follows: Second-grade pine, $3.69 per thousand feet board measure, lower than first grade; third-grade pine, $6.14 lower than first grade; third-grade spruce, $1.84 lower than mixed-grade spruce; unsorted spruce, $0.61 lower than mixed-grade spruce.

In regard to the different widths, the following schedule applied during the latter part of the war but was changed almost weekly.

For the different widths the following schedule, based on prices for stock 6½ and 7 inches in width, applied during the war, but was changed almost weekly: Stock 8 inches in width, $1.23 per thousand feet higher than the basic price; 9 inches, $6.14 higher; 10 inches, $7.37 higher; 11 inches, $12.29 higher; 6 inches, $0.61 less than basic price; 5 and 5½ inches, $1.23 less; 4 and 4½ inches, $2.46 less.

The above schedule is approximately the one used at the present time, with the exception that 11-inch stock is quoted at much higher prices than given here. This is no doubt temporary and is due to the absence of such stock formerly largely supplied by Russia.

For different thicknesses the following extra charges apply to the United Kingdom and other countries in Europe: Three-fourths inch stock, $1.23 per thousand feet; five-eighths inch stock, $2.46; one-half inch stock, $4.92. For Australia and South Africa, the extra charges are: Three-fourths inch stock, $1.84 per thousand feet; five-eighths inch stock, $3.69; one-half inch stock, $6.14.

For bundling lumber $1.23 per thousand feet is charged.

For planing the different profiles extra charges per thousand feet are made as follows: For tongued and grooved (t.g.), tongued, grooved, and beaded (t.g.b.), tongued, grooved, and V-jointed (t.v.g.), and rabbeted and V-jointed, $0.61 higher than for stock surfaced on four sides; for tongued, grooved, and beaded (on two sides), tongued, grooved, and V-jointed (on two sides), and rabbeted and V-jointed (on two sides), $1.84 higher than for stock surfaced on four sides; weatherboards, $2.46; weatherboards checked and chamfered, $3.69.

The following quotations may be considered as average for the years 1905 to 1918, inclusive. They are given in dollars per thousand feet board measure and are based on mixed grades of pine and spruce f. o. b. Norwegian southeastern ports.

Years.	Pine.	Spruce.	Years.	Pine.	Spruce.
1905	$20.28	$17.82	1912	$25.81	$24.58
1906	23.35	20.89	1913	25.81	24.58
1907	23.96	22.12	1914	26.42	25.19
1908	22.12	20.28	1915	31.95	30.72
1909	23.35	21.51	1916	45.47–49.16	45.47–49.16
1910	25.19	23.96	1917	61.45	61.45
1911	25.81	24.58	1918	63.90	63.90

During 1918 prices constantly advanced, and this movement was continued in 1919. In the autumn of 1919 the prices for pine and spruce were approximately $72 per thousand feet.

The Norwegian prices are about the same as those obtained by the Goteborg shippers in Sweden, the variation, if any, being the difference in freight rates. The tendency is to demand higher prices for spruce than for pine, as a consequence of the scarcity of spruce lumber since Russia ceased to be an important exporter of this stock. Furthermore, the increasing quantities of spruce pulp wood, demanded by the local pulp factories in Norway, tends to increase the price of spruce lumber.

Lumber is seldom furnished on specified-length specifications. The mills sell on an average length basis separate for planks, battens, and boards. Short lumber, 6, 7, and 8 feet, not exceeding 3 to 5 per cent of the cargo, is taken at two-thirds price.

The following schedule gives the average lengths of rough lumber from the majority of the export mills in Norway: Planks, 16 to 17 feet; battens, 15 to 15 feet; scantlings, 14 to 15 feet; boards, 12 to 14 feet. Planed boards average 13 to 15 feet in length. For longer average lengths or for specified lengths extra charges are made, varying from $2.46 to $7.37 per thousand feet.

Split wood (mill ends) is sold by the cubic fathom (216 cubic feet). Before the war the prices ranged between $13 and $20 per cubic fathom. In 1918 and 1919 the prices were from $55 to $70 per cubic fathom.

Staves are sold per Petrograd standard. Before the war prices were from $12 to $14 and in 1918 and 1919 $55 to $60 per thousand feet.

The following average values per thousand feet are given for the different categories of lumber in the official statistics:

Years.	Planed lumber, all kinds.	Planks, battens, and boards.	Cull stock and small dimensions.	Box shooks.	Staves.
1888	$15.80	$12.30	$8.50	$12.00	$10.10
1889	17.70	13.90	9.50	13.30	12.00
1890	16.50	12.65	9.15	12.65	10.75
1891	15.15	11.50	8.45	12.00	9.80
1892	14.85	11.40	8.45	11.70	8.20
1893	15.30	11.80	8.50	11.85	8.20
1894	16.45	12.00	8.75	11.85	8.35
1895	16.45	11.75	8.75	11.70	8.35
1896	19.60	12.50	9.70	12.30	9.50
1897	20.85	13.90	10.10	12.65	10.75
1898	19.90	13.90	10.10	12.65	11.40
1899	19.80	14.40	10.60	13.30	12.00
1900	19.90	15.55	11.40	13.60	12.30
1901	20.10	14.25	10.75	12.00	10.75
1902	19.30	14.60	10.75	12.65	10.90
1903	20.75	15.40	10.75	12.65	11.40
1904	18.95	14.25	9.80	12.00	10.55
1905	17.50	13.70	10.75	12.15	10.90
1906	20.15	16.55	12.25	14.40	13.90
1907	22.10	16.25	11.70	14.40	17.05
1908	22.60	16.45	10.40	15.15	15.80
1909	23.25	17.90	12.20	15.15	13.30
1910	25.65	20.45	13.30	22.75	14.50
1911	25.45	18.95	13.30	25.30	15.50
1912	24.45	17.20	15.60	29.20	15.75
1913	25.80	20.65	14.85	30.30	18.70
1914	26.10	21.40	15.80	30.30	19.85
1915	36.15	26.65	23.40	39.15	21.80
1916	41.80	33.50	27.85	45.60	27.85
1917	55.75	46.10	40.45	69.45	39.15

The value per cubic foot of Norwegian timber as given in official statistics for 1917 is as follows:

	Cents per cubic foot.
Hewn and round timber:	
Spars and small round timber	32.7
Telegraph poles	31.9
Mining timber	25.5
Pit props	30.3
Pulp wood	19.8
Saw logs and other round timber	19.0
Sawn timber:	
Heavy sawn timber	39.4
Railroad ties	26.7

The value per cubic foot of Norwegian timber as given in official statistics for 1913 is as follows:

	Cents per cubic foot.
Timber longer than 75 inches:	
Round timber—	
Spars and small round timber	20.5
Telegraph poles	14.3
Mining timber	11.2
Pit props	8.5
Small round timber, Dutch specifications	13.3
Hewn timber—	
Heavy hewn timber	10.0
Small hewn timber	17.8
Small hewn timber, Danish specifications	15.2
Timber shorter than 75 inches:	
Pit props	8.4
Railroad ties	13.3
Pulp wood	9.1
Firewood	6.3

CLAIMS.

There are very few claims in connection with lumber shipments from Norway, as practically all lumber is branded to indicate its quality and the name of the shipper, which eliminates tampering with the grades or other misrepresentation.

It is estimated that more than 90 per cent of the claims on the rough lumber shipped from Norway is due to defective seasoning, as discoloration is strongly objected to by many importers. The claims are generally adjusted by the exporters' agents, as the Norwegian exporters do not maintain any arbitration service in foreign countries. Claims for discoloration are generally settled by an allowance of $2.46 to $3.69 per thousand feet.

Claims in regard to planed lumber may be the result of discoloration, but usually are on account of scant stock . With the increase in price of raw material the Norwegian exporters have been forced to economize as much as possible, and in many cases this may lead to the shipping of stock a trifle scant, so that the cutter marks do not show along the entire length and width of the back of the board. Most of the importers are very critical in this respect and lodge claims for the least discrepancy in measurements.

A micrometer is sometimes used by the importers to measure north European lumber. An ordinary inch rule would not enable some importers to measure as closely as they desire, whereas the micrometer will disclose a discrepancy of less than one sixty-fourth of an inch.

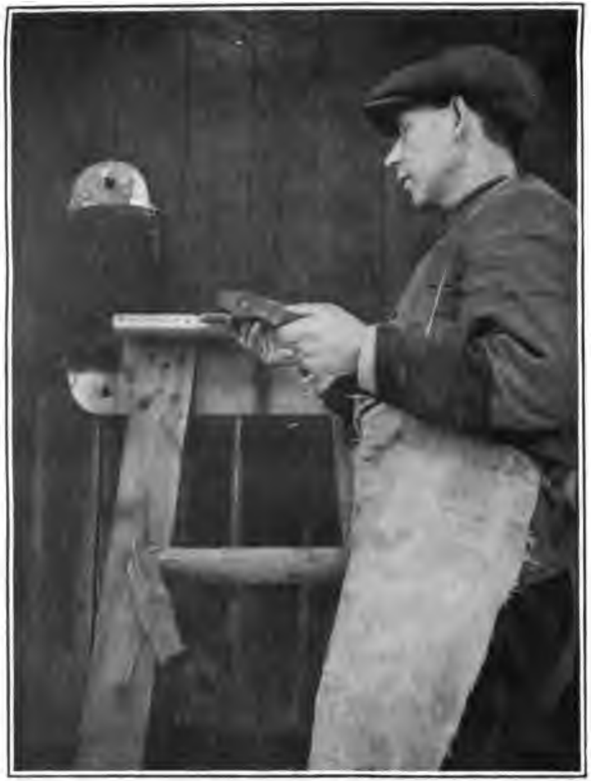


FIG. 59.—BRANDING OF LUMBER.

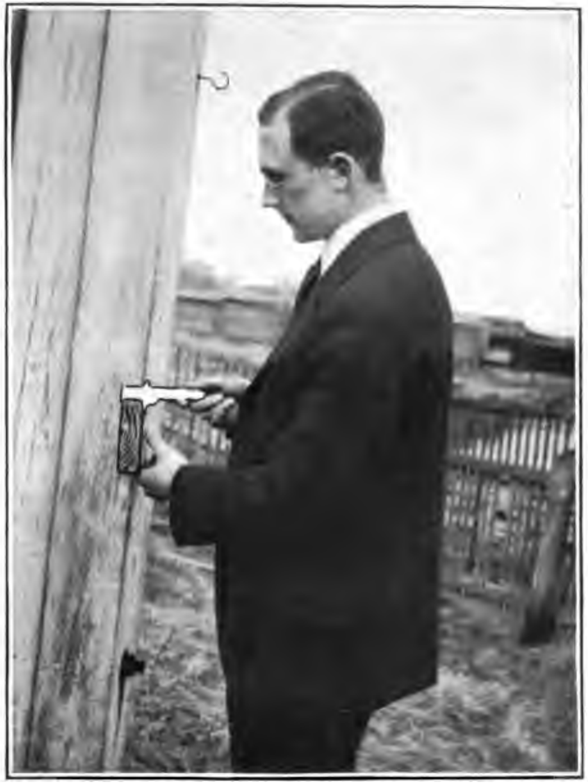


FIG. 60.—USE OF MICROMETER TO MEASURE THICKNESS OF LUMBER.

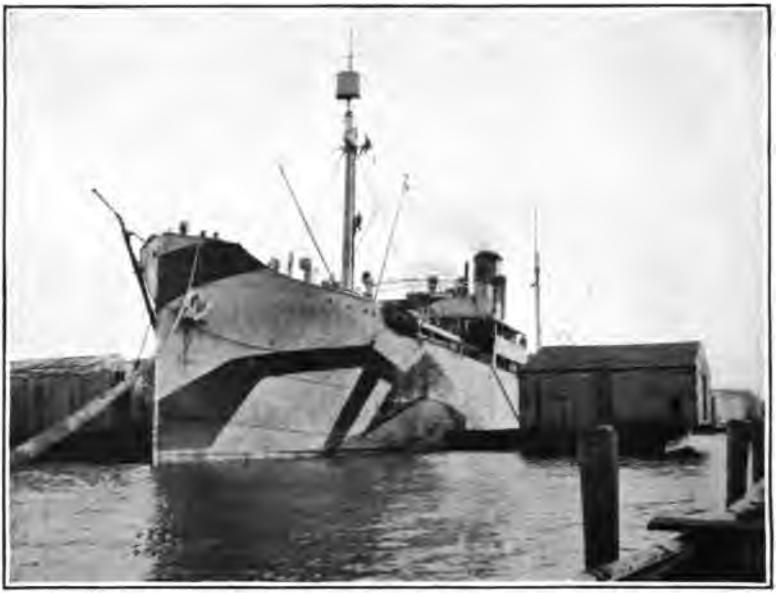


FIG. 61.—LOADING LUMBER FROM BARGES HAVING ROOF AND WALLS.

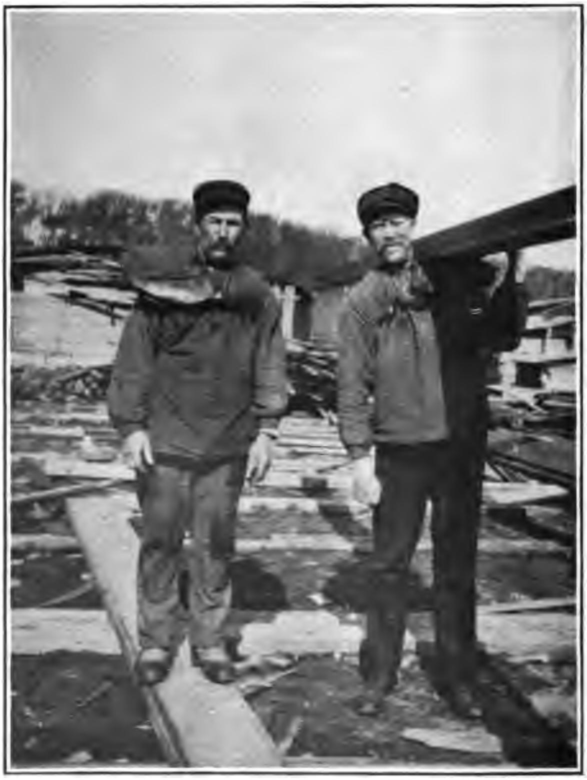


FIG. 62.—METHOD OF CARRYING LUMBER.

There is seldom or never any complaints charging exporters with substituting one dimension for another without permission. The Norwegian exporters have a very good reputation for the conscientious carrying out of contracts according to agreement. The deliveries are made on time, and firms taking a chance of obtaining the lumber after the order has been taken would not be able to do business without getting into trouble sooner or later. It is evident that no reputable shippers can afford to disregard justified claims, as this would immediately affect their reputation. Norwegian exporters have a strong foothold in the principal markets and a great many concerns have had relations with the same importing concerns for decades, and even for generations. It is very difficult to regain the confidence of the foreign customers if it has once been shaken.

COMPETITION.

Owing to the small quantities exported, the competition from other countries can not be said to have curtailed the markets for Norwegian lumber to any great extent.

Most of the Norwegian lumber is sold during a period of the year when practically no competition is offered from the other north European lumber exporting countries, and the character of the lumber from other countries is so different that the Norwegian lumber is considered in a class by itself.

Norwegian planed lumber is sold in many markets in competition with American softwood species, and has often been given the preference, mainly on account of the more careful manufacturing of the Norwegian stock. The comparative advantages of pine and spruce lumber from northern Europe and that from the principal species of softwoods in the United States, and the difference between our methods of manufacturing and selling and those of the north European countries, have been discussed in the report on the Swedish lumber industry.

LOCAL MARKETS.

Many Norwegian exporters have been very successful in catering to both domestic and foreign markets. The principal attention is naturally given to the foreign markets, for which the best stocks are reserved, but the exporters have found it is to their advantage to place on the domestic market certain stocks and dimensions for which there is only a limited demand abroad.

The local market largely takes cull stock, as fifth and lower grades, which is considered good enough for ordinary construction purposes. This stock is generally sold at prices only slightly lower than those for unsorted stock for export, and the better class of cull lumber may in many cases be sold at higher prices at home than the prices obtained for the unsorted grade abroad. The quantities sold in the domestic market are comparatively small, and this may partly explain the higher prices. In many sections of Norway the producers of lumber have agreements in regard to prices, etc., and lumber is very high in Norway, even in the center of the lumber regions. In western Norway and in the district connected with Sweden by rail important quantities of Sweden lumber are imported for domestic consumption.

The following prices per thousand feet were quoted in Christiania during the winter of 1919 for unsorted grades:

Dimensions in inches.	Pine.	Spruce.	Dimensions in inches.	Pine.	Spruce.
3 by 9	$88.80	$83.90	2½ by 6	$74.45	$71.20
3 by 8½	86.50	83.90	2½ by 5½	71.75	70.40
3 by 8	83.55	80.80	2 by 6	74.15	72.80
3 by 7	82.30	80.10	2 by 5½	73.50	73.50
3 by 6½	82.00	79.70	2 by 5	71.20	71.20
3 by 6	79.05	77.30	2 by 4½	71.85	71.85
2½ by 7	84.20	79.70	2 by 4	70.75	70.75
2½ by 6½	79.70	75.70			

Considering these high prices, it is no wonder that the building of houses has been greatly hampered in Norway.

There is practically no coal mined in Norway and wood is the common fuel used in the rural districts. The high cost of coal during the war increased the cutting of wood for fuel, and although the price of coal has decreased materially since the armistice, it is still so high that wood is still largely used instead of coal.

The cost of stumpage during the last few years has to a great extent forced the population to exercise a greater economy in the general use of wood than before, and substitutes such as cement are steadily gaining ground.

It is a peculiar fact that southern yellow pine, No. 2 common stock, has recently been shipped to Norway for construction purposes. This stock not only proved to be more satisfactory than the common Norwegian pine construction lumber, but some of it was delivered in Norway at prices below those asked for Norwegian lumber, in spite of the high freight rates prevailing at that time.

FUTURE DEVELOPMENT OF EXPORT TRADE.

It is unfortunate for Norway that its timber resources are so limited, because otherwise the country has every condition for becoming one of the leading lumber exporting countries in Europe. The excellent open harbors enable the exporters to ship the year around, while the adequate native merchant marine and the extensive service of direct liners to the principal markets, in connection with many years of experience in manufacturing and marketing of lumber, are assets which are lacking in many other lumber exporting countries.

On account of the limitations on further expansion, many Norwegian lumbermen have been forced to transfer their activities to other countries, particularly to eastern Europe, where the work of Norwegian lumbermen for years has been an important factor in the lumber and pulp industry. Even Siberian forests have been exploited by them.

The future expansion of the Norwegian lumber industry and lumber export trade is not particularly bright. It is believed that the development of the pulp and paper industry will continue, and this means higher prices for the raw material and a keener competition in the buying of saw logs, unless means should be devised to obtain raw material from other countries. The future of the Norwegian lumber industry will in this respect depend to some extent upon the development of the wood-using industries in Russia, whence a large percentage of raw material for the Norwegian lumber mills has been obtained in past years. It is likely that the time will come when Russia itself will exploit the foreign markets to better advantage and that the lumber industry in that country will develop along similar lines as in Norway. In other words, the exportation of round and hewn timber and sawn lumber will decrease and the wood will be manufactured to the highest possible extent in the country itself.

The Norwegian forests may in time yield a larger crop than at the present, but no immediate increase may be expected, because the conservation and reforestation questions are not generally appreciated or understood among the average small holders. If the forest areas owned by the wood-using industries were larger or if the forest areas were less divided, the question of rational management of the forests might have better prospects, but under present conditions it is difficult to enlighten the thousands of small holders on the problems of forestry, and there are no strict laws to enforce cutting in accordance with the principle of rational forest management or to compel reforestation of cut-over areas.

During the last year cutting in the Norwegian forests has decreased to some extent, but during the first part of the war the reckless cutting caused much damage, the effects of which will in many cases take more than a generation to overcome. It is almost certain that Norway will not be able to produce larger quantities of lumber for export than were turned out immediately before the war—approximately 300,000,000 to 350,000,000 feet of rough and planed lumber.

The future of the planing-mill industry is uncertain, on account of the possibility of having some of the principal markets, for instance, the United Kingdom, impose import duties on planed lumber, and it is not believed that additional planing mills will be constructed in Norway in the near future.

The manufacture of box shooks may, on the other hand, be still further developed, if new markets for this product can be found. The lumber exporters in Norway are in great hopes of placing their shooks in other parts of the world, such as Africa, South America, Asia, etc., where new industries are being developed that will require box material for the shipping of their products. The box export trade has excellent possibilities in Norway, because shooks are generally shipped in parcel lots, and in such cases the Norwegian direct steamship lines will be of very material assistance to the exporters.

The Norwegian box industry has heretofore been dependent to some extent upon the raw material obtained from Sweden. As the Swedish box industry has been greatly developed during late years, the competition for raw material between the Norwegian and Swedish box factories has grown keener each year, because the manufacturers in both countries take raw material from the same districts in Sweden, adjacent to the Norwegian border. A further development of the box industry in Sweden would naturally curtail the available supply of Swedish raw material for the Norwegian box factories.

The Norwegian mills may, however, obtain raw material from Russia as soon as conditions allow.

It is thus seen that the lumber export trade in Norway will not likely expand very materially in the future, but the Norwegian lumber exporters will likely continue to play an important part in the world's lumber markets, in spite of the fact that the quantities shipped are not very large. Their strong position is due to the circumstance that deliveries can be made during the periods of the year when most of the other lumber-exporting countries in northern Europe are unable to ship because their ports are frozen.

STATISTICS OF LUMBER EXPORTS.

EXPORTS OF LUMBER FROM NORWAY, 1888 TO 1919.

Years.	Planed lumber.	Planks, battens, and boards, rough.	Box shooks, planed and rough.	Staves, including birch.	Cull stock, laths, etc.	Split wood, firewood, etc.
	M feet.	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*Cubic feet.*
1888	234, 041	210, 157	15, 655	37, 217	3, 843	3, 334, 756
1889	250, 110	199, 198	15, 836	46, 365	3, 637	3, 710, 524
1890	222, 085	172, 753	21, 390	39, 263	5, 186	3, 387, 070
1891	245, 410	184, 986	23, 400	39, 140	4, 491	3, 088, 256
1892	207, 706	168, 673	29, 381	32, 658	5, 128	3, 628, 346
1893	213, 755	157, 861	30, 720	36, 422	4, 121	2, 635, 322
1894	212, 371	161, 847	27, 529	33, 624	3, 291	3, 221, 725
1895	215, 676	161, 719	29, 388	39, 288	6, 966	3, 566, 394
1896	236, 826	195, 847	32, 439	39, 237	5, 654	3, 865, 527
1897	252, 945	237, 965	32, 623	36, 755	5, 057	4, 642, 480
1898	254, 096	220, 401	31, 822	36, 393	4, 245	4, 410, 382
1899	246, 085	205, 771	27, 653	34, 582	4, 765	4, 035, 884
1900	243, 467	195, 011	27, 697	36, 749	3, 828	3, 621, 392
1901	239, 874	167, 127	28, 214	38, 906	3, 450	3, 529, 965
1902	253, 792	193, 667	29, 192	36, 253	4, 478	3, 297, 585
1903	281, 993	208, 588	33, 837	37, 479	5, 853	3, 631, 205
1904	242, 650	170, 313	35, 765	38, 201	6, 036	3, 456, 152
1905	236, 876	197, 294	46, 864	35, 766	5, 286	3, 189, 743
1906	271, 692	200, 874	49, 013	42, 745	7, 225	3, 384, 246
1907	247, 489	159, 326	52, 568	52, 880	7, 958	3, 384, 599
1908	185, 762	121, 261	57, 277	34, 722	5, 713	2, 519, 643
1909	208, 879	112, 248	56, 950	23, 441	4, 273	1, 953, 820
1910	186, 534	95, 074	61, 783	26, 429	4, 131	1, 729, 135
1911	172, 907	83, 066	57, 534	23, 462	3, 412	1, 837, 824
1912	163, 729	83, 961	57, 260	23, 096	3, 155	1, 368, 157
1913	177, 698	73, 993	51, 924	16, 394	3, 326	1, 059, 671
1914	163, 730	51, 255	44, 607	12, 642	2, 833	645, 708
1915	165, 510	131, 474	52, 847	10, 392	1, 911	554, 598
1916	145, 001	119, 183	66, 438	11, 501	1, 713	367, 191
1917	125, 938	156, 912	52, 702	3, 816	988	11, 084
1918	98, 450	121, 279	49, 432	6, 655	1, 067	15, 461
1919	119, 418	98, 696	26, 190	3, 559	342	21, 004

EXPORTS OF LUMBER AND TIMBER FROM NORWAY, BY COUNTRIES, 1906 TO 1919.

Countries of destination.	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
Planed lumber of all kinds:	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*
United Kingdom	190,591	168,794	120,831	144,864	106,062	110,377	104,539	93,329	95,888	126,805	108,048	108,077	78,640	102,004
Belgium	720	1,079	1,162	555	117	414	....	1,043	253	....	....	....	....	....
Netherlands	16,952	12,382	11,567	10,148	6,853	5,629	6,444	3,227	4,806	12,085	13,080	5,940	808	4,726
France	....	86	46	....	....	2	....	11	....	....	8,926	8,172	13,032	8
Germany	3,372	4,010	3,565	2,035	2,180	2,181	1,562	1,513	1,235	....	....	....	....	....
Denmark	1,996	3,072	1,827	1,964	770	780	379	570	256	6	140	93	....	57
British East Indies	....	....	....	920	455	1,072	755	1,254	1,531	1,368	1,402	393	....	500
South Africa	....	8,401	5,513	9,801	8,357	10,159	8,138	11,306	3,568	4,376	7,871	2,970	5,722	749
East Africa	....	....	....	....	891	767	601	1,273	191	203	494	....	100	321
West Africa	....	....	....	123	128	145	509	435	115	....	....	....	....	....
Australia	46,179	46,939	38,958	35,099	59,075	39,884	39,122	62,689	54,499	18,958	4,296	....	....	10,930
Other countries	11,882	2,726	2,293	3,370	1,646	1,497	1,680	1,048	1,388	1,709	744	293	148	123
Total	271,692	247,489	185,762	208,879	186,534	172,907	163,729	177,698	163,730	165,510	145,001	125,938	98,450	119,418
Planks, battens, and boards:														
United Kingdom	79,542	60,198	37,024	32,581	25,790	19,678	21,708	22,307	24,333	122,513	73,472	135,905	92,380	80,398
Belgium	44,797	32,113	35,055	31,953	28,157	29,117	21,574	23,138	4,640	....	....	....	....	7,555
Netherlands	14,331	7,416	4,485	5,862	6,549	5,119	13,040	6,233	7,389	1,047	22,174	14,427	....	650
France	24,071	25,260	17,905	18,712	12,168	8,782	9,311	6,022	4,863	3,030	17,429	3,513	21,514	5,646
Germany	19,599	16,611	13,371	10,200	8,356	8,254	7,368	4,237	3,069	129	....	....	....	....
Denmark	6,299	6,526	3,820	2,526	1,924	1,863	1,493	1,429	810	504	435	60	....	44
Iceland	3,554	3,707	3,151	1,730	1,941	1,870	1,435	1,476	1,257	717	885	534	490	760
Sweden	2,005	2,282	1,794	2,986	1,818	2,234	1,550	1,378	1,493	892	1,117	921	638	486
South Africa	....	2,649	1,829	3,967	2,922	2,089	943	2,479	733	1,276	2,608	1,292	4,084	189
East Africa	....	....	....	....	1,341	1,480	950	2,304	467	214	271	....	365	459
West Africa	....	....	....	53	146	134	333	111	47	....	....	....	....	....
Australia	441	859	221	498	2,238	1,189	872	1,823	445	689	122	....	....	526
Brazil	....	....	644	....	109	....	1,840	518	979	169	....	....	....	....
Other countries	6,235	1,705	1,962	1,180	1,615	1,257	1,544	538	730	294	670	260	1,808	1,983
Total	200,874	159,326	121,261	112,248	95,074	83,066	83,961	73,993	51,255	131,474	119,183	156,912	121,279	98,696
Sawn and planed box shooks:														
United Kingdom	31,618	36,106	41,641	44,021	43,553	39,010	42,683	40,427	35,039	49,521	62,213	51,514	49,429	24,674
Belgium	2,135	3,748	2,393	2,981	2,527	2,164	2,243	1,674	255	....	....	....	....	1,065
Netherlands	234	461	672	161	1,657	616	380	311	1,021	228	....	303	....	....
France	....	574	87	....	226	....	....	....	....	....	564	....	....	....
Germany	1,325	2,243	1,483	1,736	2,173	2,109	2,070	2,057	2,313	346	....	....	....	....
British East Indies	3,197	1,282	....	161	3,961	4,383	616	90	130	109	40	....	....	....
Siam	....	....	....	....	408	....	1,341	....	15	....	....	....	....	....
Other countries in Asia not specified	....	....	2,985	1,672	....	....	389	692	723	....	713	....	....	60
South Africa	....	385	89	482	1,199	1,392	1,128	1,749	1,852	850	1,546	852	3	33
Canary Islands	8,991	6,152	6,226	2,358	4,142	4,586	4,552	3,783	....	686	742	....	....	....

EXPORTS OF LUMBER AND TIMBER FROM NORWAY, BY COUNTRIES, 1906 TO 1919—Continued.

Countries of destination.	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
Sawn and planed box shooks—Continued.	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*
Australia	330	557	731	1,698	1,098	1,725	1,266	879	577	674	293	19	....	....
Other countries	1,183	1,060	970	1,680	839	1,549	592	262	2,682	433	327	14	....	358
Total	49,013	52,568	57,277	56,950	61,783	57,534	57,260	51,924	44,607	52,847	66,438	52,702	49,432	26,190
Staves, including birch staves:														
United Kingdom	29,146	37,681	25,131	15,239	18,288	12,671	14,603	10,357	9,300	8,778	10,700	3,702	4,737	3,497
Belgium	3,817	2,944	444	1,545	2,603	3,191	2,452	806	316	....	....	....	....	....
Netherlands	2,804	1,733	1,494	831	1,517	2,745	1,819	1,317	1,257	165	....	....	....	....
France	1,057	2,557	2,766	1,777	15	1,211	719	....	....	....	....	....	1,797	....
Germany	3,647	3,050	1,848	1,388	1,408	1,347	1,742	2,113	451	....	....	....	....	....
Canary Islands	1,179	1,057	2,296	2,382	2,023	928	1,019	1,118	....	....	506	....	....	....
Other countries	1,095	858	743	279	575	1,369	742	683	1,318	1,449	295	114	121	62
Total	42,745	52,880	34,722	23,441	26,429	23,462	23,096	16,394	12,642	10,392	11,501	3,816	6,655	3,559
Cull lumber, laths, and similar stock:														
United Kingdom	4,139	4,707	3,785	2,926	3,248	2,458	2,113	2,495	2,198	1,406	1,630	859	987	267
Other countries	3,086	3,251	1,928	1,347	883	954	1,042	831	635	505	83	129	80	75
Total	7,225	7,958	5,713	4,273	4,131	3,412	3,155	3,326	2,833	1,911	1,713	988	1,067	342
Mining timber:	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
United Kingdom	4,639,302	4,819,686	4,227,704	3,046,391	2,928,594	2,569,769	2,605,457	2,437,711	3,633,394	2,924,499	2,124,354	215,083	69,506	1,354,920
Other countries	247,171	133,363	68,800	37,276	31,064	5,719	19,522	248,866	40,842	....	600	14,579	21,004	7,554
Total	4,886,473	4,953,049	4,296,504	3,083,667	2,959,658	2,575,488	2,624,979	2,686,577	3,674,236	2,924,499	2,124,954	229,662	90,510	1,362,474
Pit props:														
United Kingdom	7,821,280	7,141,895	5,941,096	2,818,669	2,922,664	3,533,106	2,955,068	2,516,289	2,506,088	12,570,894	17,049,371	5,061,208	2,020,325	8,269,802
Other countries	39,500	36,924	4,906	43,914	117,795	10,096	10,167	26,900	34,100	67,989	148,789	106,606	5,860	127,468
Total	7,860,780	7,178,819	5,946,002	2,862,583	3,040,459	3,543,202	2,965,235	2,543,189	2,540,188	12,638,883	17,198,160	5,167,814	2,026,185	8,397,270
Telegraph and telephone poles:														
United Kingdom	980,705	767,069	514,674	406,832	383,217	508,567	410,926	481,493	624,739	368,250	89,945	....	11,155	82,355
Denmark	143.883	255,043	189,213	23,086	14,261	30,499	104,206	11,931	3,354	17,650	74,271	....	....	126,798
Iceland	....	38,300	9,072	4,871	12,602	21,004	7,625	33,641	40,701	42,360	49,561	3,707	635	32,476
Other countries	65,905	22,486	64,670	63,117	56,515	1,200	16,909	10,978	1,765	3,671	6,707	....	4,554	5,860
Total	1,190,493	1,082,898	777,659	497,906	466,595	561,270	539,666	538,043	670,559	431,931	220,484	3,707	16,344	274,489

Split wood (firewood):														
United Kingdom	1,795,429	1,641,803	1,206,766	638,824	535,854	748,890	467,549	369,132	245,194	180,524	31,276	....	....	....
Sweden	1,350,648	1,467,492	1,107,432	1,054,058	1,010,110	998,955	786,624	596,394	352,011	329,102	335,915	10,837	15,461	16,944
Denmark	234,639	263,620	196,056	216,530	153,696	79,390	100,323	92,557	38,901	43,419	....	....	....	....
Other countries	3,530	11,684	9,389	44,408	29,475	10,589	13,661	1,588	9,602	1,553	....	247	....	4,060
Total	3,384,246	3,384,599	2,519,643	1,953,820	1,729,135	1,837,824	1,368,157	1,059,671	645,708	554,598	367,191	11,084	15,461	21,004
Spars and small round timber:														
United Kingdom (including Ireland)	609,066	561,552	442,980	534,195	604,900	582,272	472,876	421,375	552,199	324,053	119,172	111,266	119,173	195,844
Netherlands	67,246	41,089	32,617	59,975	53,515	39,854	57,010	35,724	36,041	57,327	67,317	121,255	19,697	122,985
France	16,167	20,474	24,781	26,616	33,182	31,911	22,063	21,109	34,523	177	....	....	....	....
Denmark	1,165	....	141	5,648	....	22,592	13,343	13,485	671	....	1,553	177	....	....
Other countries	18,039	31,594	20,438	14,579	33,253	21,076	8,015	12,850	75,781	20,722	23,264	3,212	177	6,919
Total	711,683	654,709	520,957	641,013	724,850	697,705	573,307	504,543	699,152	402,279	211,306	235,910	139,047	325,748
Railroad ties:														
United Kingdom	92,627	77,942	62,305	5,577	38,830	29,794	23,616	23,051	16,167	....	....	....	....	....
Other countries	....	....	....	....	....	388	....	....	....	....	....	918	....	....
Total	92,627	77,942	62,305	5,577	38,830	30,182	23,616	23,051	16,167	....	....	918	....	....
Small hewn and sawn timber:														
United Kingdom	323,948	146,248	142,894	340,857	234,533	472,208	298,956	197,926	327,124	426,707	....	....	....	....
Netherlands	729,510	394,760	364,119	267,539	222,567	213,318	170,993	85,884	33,535	28,205	....	....	....	....
Germany	1,281,142	1,213,509	1,057,659	790,614	660,426	925,458	533,135	381,664	197,081	....	....	....	....	....
East Africa	....	....	....	....	48,926	44,372	53,480	71,977	16,379	6,636	....	....	....	....
Other countries	278,518	299,802	262,915	218,718	120,339	131,742	92,875	60,576	38,231	13,308	....	....	....	....
Total	2,613,118	2,054,319	1,827,587	1,617,728	1,286,791	1,787,098	1,149,439	798,027	612,350	474,856	....	....	....	....
Hewn timber:														
United Kingdom	1,477,305	2,027,950	1,602,338	1,624,436	1,885,480	1,380,582	1,724,758	1,641,626	1,517,757	794,886	....	....	....	....
Netherlands	49,526	47,231	71,765	12,249	8,013	38,195	26,404	34,629	26,440	7,766	....	....	....	....
Germany	24,110	18,462	....	16,379	....	1,200	52,774	....	16,591	....	....	....	....	....
Denmark	185,678	152,002	110,524	89,062	63,328	39,960	56,762	86,309	17,474	48,502	....	....	....	....
Other countries	19,874	2,047	8,331	2,365	7,483	7,131	953	106	38,407	....	....	6,460	....	....
Total	1,756,493	2,247,692	1,792,958	1,744,491	1,964,304	1,467,068	1,861,651	1,762,670	1,616,669	851,154	....	6,460	....	....
Pulp wood:														
United Kingdom	21,815	10,731	....	....	....	....	....	27,640	106	....	....	....	....	62,799
Other countries	1,481,788	2,010,759	1,373,523	823,231	898,420	1,064,048	....	2,153	....	34,029	98,028	367,473	673,077	382,581
Total	1,503,603	2,021,490	1,373,523	823,231	898,420	1,064,048	....	29,793	106	34,029	98,028	a 367,473	a 673,077	a 445,380

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a Includes saw logs mainly exported to Sweden.

IMPORTATION OF FOREIGN WOODS.

SOURCES OF IMPORTS.

Although Norway produces considerable quantities of lumber for export, special conditions make it necessary for that country to import certain species of foreign woods. The coniferous species native to Norway are suitable only for ordinary construction work and for a low grade of interior finish, joinery, etc., that is to be covered with paint, because the presence of knots and other defects render the Norwegian coniferous species unsuitable for the better class of cabinetwork. Furthermore, the native coniferous species are only obtainable in small sizes and do not furnish timber for heavy construction work requiring long lengths and wide stock.

The native hardwoods found in Norway are insufficient in quantity to supply the needs of the country, and also of inferior quality, so that the better species of hardwoods must be imported.

Although Norway will never be a market of great importance for American lumber, the excellent steamship connections with the United States will greatly facilitate the importation of certain American stock, and it should not be difficult to obtain a reasonably good market in Norway for certain species of American lumber. A short outline is therefore given of the present status of the lumber import trade in Norway and the possibility of expansion in the future.

The Norwegian statistics of the importation of lumber, timber, etc., are very indefinite, and use such designations as "Swedish wood," "Wood in general," "Other kinds of wood," etc., without specifying species, dimensions, or degree of manufacture. The quantities are generally given in kilos, which does not permit the ascertaining of the quantities in cubic feet or board feet with any reasonable exactness, because the species are not given. The main importation of wood has consisted of Swedish, Finnish, and Russian pine and spruce, which have largely been imported into Norway for reexportation in some manufactured form. The importation of what is termed "Other species" is supposed to represent mostly hardwoods and will be of main interest to the American exporters.

Classes and countries of origin.	1913	1916
Timber and lumber:		
Pine and spruce—		
Sweden	$1,264,183	$7,408,217
Finland and Russia	1,657,071	284,053
Total	2,921,254	7,692,270
Other species—		
Sweden	8,094	24,013
Denmark	58,183	108,808
Germany	152,680	31,999
Holland	6,700	75,254
Belgium	6,459	....
United Kingdom	73,298	54,860
France	455	....
United States	83,857	491,780
Mexico	30,793	....
Central America	1,688	....
East Africa	....	7,692
Argentina	54	12,864
Other countries	107	268
Total	422,368	807,538
Staves, unmanufactured:		
Sweden	$31,168	$43,121
Denmark	3,538	5,575
Baltic Provinces of Russia	12,194	....
Finland	59,576	....
Germany	2,760	1,581
United States	4,208	5,735
Mexico	2,358	10,908
Other countries	885	90
Total	116,687	67,000
Staves, manufactured:		
Oak	37,440	16,268
Other species	482	23,128
Total	37,922	39,396

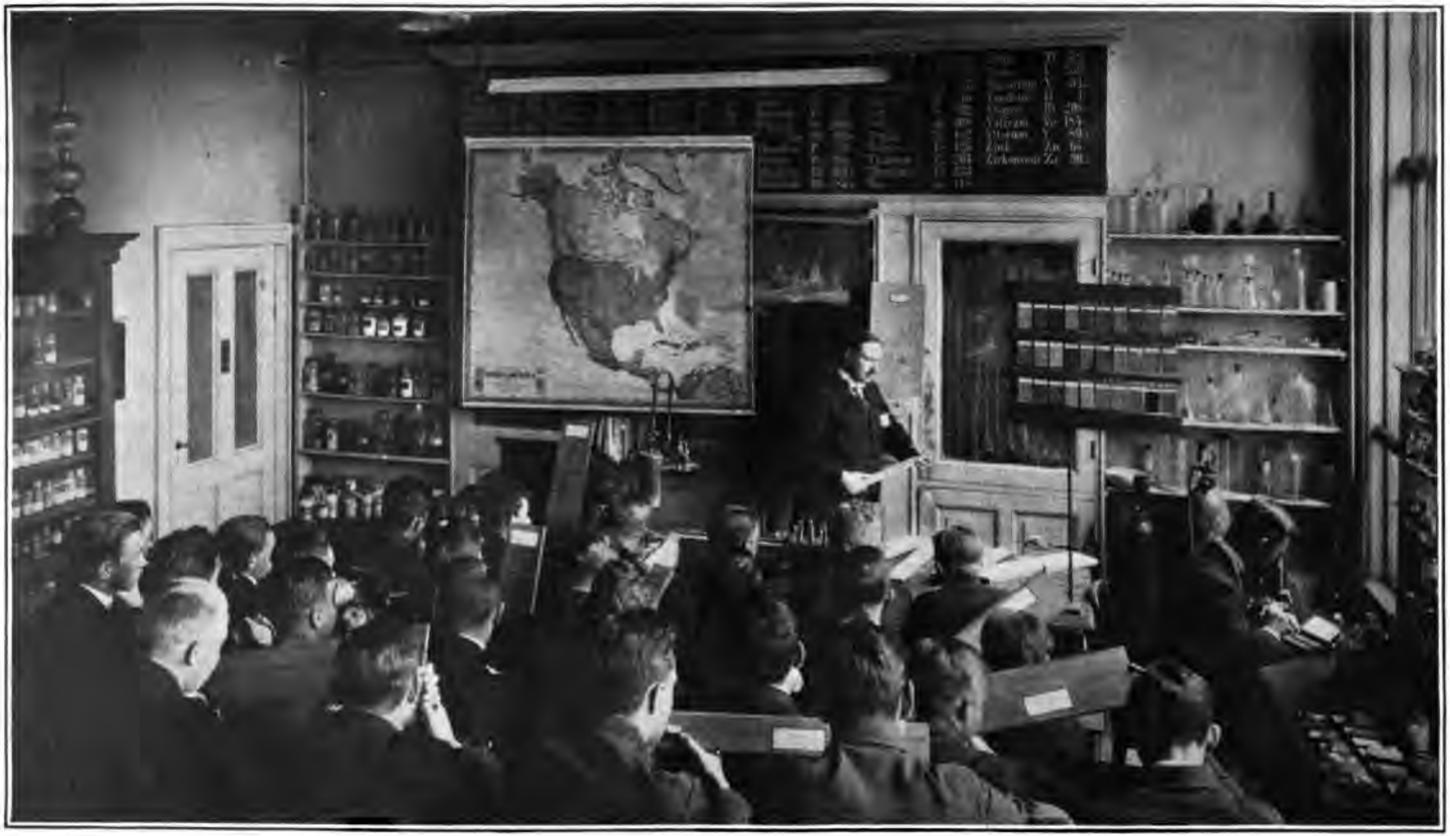

FIG. 63.—DEMONSTRATION OF AMERICAN LUMBER AT THE COMMERCIAL COLLEGE, CHRISTIANIA.

UNIV. OF MICH.

The value of imports of timber, lumber, and staves in 1913 and 1916 is given in the table on page 128.

From this table it is seen that Germany, before the war, had the leading position in furnishing lumber to Norway. There is no doubt that large quantities of native German lumber and timber were exported, particularly German oak, but Germany also reexported considerable quantities of lumber from foreign countries, such as Japanese oak, and also several species of American woods, which were transshipped or reexported from the ports of Hamburg, Bremen, etc., being taken over in cargo lots or in parcel shipments on the regular liners by German importers and agents for distribution to the other countries in northern Europe.

Next to Germany the United States figured as the largest supplier of foreign lumber. This condition compares favorably with those in many other European lumber-importing countries, where the steamship connections between the United States and these countries are less satisfactory. There are direct steamship lines from the Pacific coast, the Atlantic coast, and the Gulf coast to Norway, offering adequate facilities for the shipping of lumber in parcel lots.

The United Kingdom supplied almost as large quantities as the United States before the war, but it is thought that very small quantities of native species were exported from the United Kingdom. Nearly all of the quantities represented lumber from other parts of the world that were reexported by the merchants in that country.

Denmark has also been a considerable source of supply. Some Danish beech has been exported to Norway, but the bulk of the lumber was transshipped or reexported from Denmark. Copenhagen in Denmark has many advantages for a satisfactory transshipping point to the other surrounding countries. This port has a free harbor and adequate steamship connections with Scandinavia, Finland, and Russia. These circumstances largely explain how Denmark has secured such a large share of the Norwegian import trade, in spite of the fact that the country has very limited forest resources of its own.

Mexico has supplied considerable quantities of hardwood lumber and logs. It is connected with Norway by a direct steamship line. The lumber imported from Sweden, Holland, and Belgium mainly referred to stock transshipped or reexported from these countries.

These were the conditions in the lumber import trade of Norway before the war, but after the war broke out a considerable change took place. The value of imports of lumber in 1916 was just about double that of 1913. The United States supplied more than half of the amount, the balance being shipped mainly from Denmark, Holland, and the United Kingdom. Germany supplied only one-fifth of its prewar shipments in 1916. During the war the Norwegian importers were forced to seek direct connections with the producing countries.

That the value of the importation of foreign lumber in 1916 increased 100 per cent over 1913 does not mean that the quantities were increased in proportion. The value of foreign lumber increased very materially in 1916, at least 50 per cent above the prewar level, and the quantities may represent a corresponding increase.

In 1913 Norway imported about $117,000 worth of unmanufactured staves and in 1916 $67,000 worth. Most of these originated in Sweden, Finland, and Russia, and no doubt were staves of pine and spruce used by the Norwegian factories to make containers for fertilizer and also by the fish establishments for fish barrels. The small quantities imported from Denmark were mostly beech staves and were used by the Norwegian butter factories. The staves from Germany and the United States were mainly oak staves used by the breweries and other factories in need of this material.

The importation of veneer amounted to approximately $260,000 in 1913 and $45,000 in 1916. No information is given in regard to species or the country of origin, but from private sources it was learned that this material was shipped principally from Germany, Holland, and the United Kingdom.

KINDS OF WOOD IMPORTED.

Oak is the principal foreign wood imported into Norway, and white oak represents the largest quantities. Oak is used in Norway for furniture, interior finish, joinery, shipbuilding, and for a multitude of other purposes for which this wood is particularly adapted. Most of the oak imported comes from Germany and America. The German oak is generally well liked, as it is soft and easily worked. It is imported in the shape of logs which have been sawn in Germany. The boards are not edged and consequently the Norwegian importers pay for a great deal of waste. (See illustration facing page 265 of the report on the lumber industry of Sweden.) The advantage of importing the lumber in this form seems to be that the carpenters are better able to match one piece with another to obtain the same figuring.

American white oak is more presentable, each board being graded and edged, whereby the entire board may be utilized without waste. The American oak is harder than the German, has a more even color, and is obtainable in clear grades.

Japanese oak was imported in limited quantities before the war, mostly in hewn logs. This stock was largely shipped from Hamburg, to which port it was consigned from Japan. Japanese oak is not considered on a par with American or German oak, because it lacks the luster and does not polish as satisfactorily. Furthermore, the texture is said to be somewhat spongy, and the fibers are short and brittle. The color is also generally uneven, making it difficult to match one piece with another. The main virtue of Japanese oak has been its relative cheapness. It has been used for the cheaper grades of furniture, but the sale has not been actively pushed, so that it has not obtained a strong foothold in Norway.

Slavonian oak has been imported in considerable quantities, but during late years it has been too expensive for the Norwegian market.

The use of oak in Norway does not seem to be dependent upon a fad or a temporary demand, and in this respect is rated in the same class as mahogany. There has always been a demand in Norway for oak, and this demand will grow, unless the price in the future should be prohibitive. The oak produced in Norway is very coarse and knotty and does not lend itself to the better class of furniture, etc. The quantities produced are also extremely limited. Norwegian oak is, therefore, only used for rough construction purposes, and especially for fenders on boats going through the ice floes.

American hickory and ash are used to some extent for handles, carriage construction, and also for ski stock. Veneer of Hungarian ash is taken in small quantities and used for finish in boats and street cars. Norway produces limited quantities of ash, which is considered better than American ash for ski stock, because American wood is generally more brittle and looser in texture. The size of the Norwegian ash logs is very small.

Some small quantities of red gum have been imported, under the name of satin walnut, and used for interior finish. It is claimed that this wood is not suitable for furniture, because the texture is too loose for this purpose. The beautiful figuring is appreciated, and this wood is very acceptable for panel and finish.

Some sap gum was sold in Norway under the name of hazel pine before the war, but there was only a limited market for it, because it came into direct competition with native birch, which is a more suitable wood for many purposes.

Yellow poplar was a very popular wood in Norway before the war, and was sold under the name of whitewood. The increased price of this species during late years made it difficult for the importers to sell any large quantities. It seemed that yellow poplar was destined to obtain a very strong position, both in Norway, Sweden, and Finland, until the price increased to such an extent that its use was restricted. This wood was put to a multitude of uses—for making patterns, novelties, building up of veneer, etc.—because it did not warp or check and was easily worked with tools. There is decidedly a market in these countries for other species of American woods possessing the same desirable qualities as yellow poplar but selling at a lower price. Yellow poplar was sold c. i. f. Christiania at $55 per thousand feet in 1913.

American walnut was previously used in some quantities mainly for gunstocks, but during late years Danish beech has taken its place, on account of the scarcity of walnut and the high prices demanded. Walnut was also used for furniture, finish, telephone apparatus, and for other uses of a similar nature.

American maple is practically unknown in Norway, but it is believed that a good market could be found for maple flooring in the better class of buildings, if this material were known.

Mahogany is and will always be a popular wood in Norway. It is used for furniture, interior finish, and a multitude of other purposes. Both African and Central American mahogany have been imported, and some mahogany was also imported from Cuba.

Teak has been imported to a limited extent and used for shipbuilding, car siding, etc. This wood is very expensive, and has not, on this account, found a ready market in Norway.

The scarcity of high-grade hardwoods has caused the Norwegian importers to look for their supplies in other parts of the world. One Norwegian importer recently acquired important holdings of valuable hardwood forests in West Africa, while others have started logging operations in South America, and it is expected that these sections of the world will to a great extent supply the future demand for hardwoods in Norway and in the other northern European countries.

During the war a company in Norway constructed a veneer mill in the southern part of the country, near the city of Christiansand.

This company bought timberland in northern Brazil, and takes the logs on its own vessels to this veneer mill. The production is mainly based on export.

The only competition which foreign hardwoods meet in Norway is the native birch. Native birch is suitable for a variety of uses, and may truly be called a general-utility wood. Before the war birch logs sold for about 15 cents per cubic foot, but in 1919 the average price was 65 cents per cubic foot.

Norwegian birch is not obtainable in wide stock or long lengths, and lacks a great many of the qualities that are desirable for woods to be used for the better class of finish and similar purposes. Clear birch is scarce and high in price, so that foreign species of this quality must be relied upon. Of other native hardwoods there are practically none produced in commercial quantities.

OPPORTUNITIES FOR SALE OF AMERICAN LUMBER.

Norway being a considerable producer of softwoods, it is evident that the market for foreign softwood lumber must necessarily be limited. The purchasing power has been relatively small, and the public was not educated to demand clear lumber. Knots were pronounced by enterprising contractors to be an artistic attraction to panels and finish, and in many Norwegian houses ordinary pine and spruce panels containing a multitude of knots have been given a natural finish showing these "artistic" defects. In other cases the woodwork is painted or grained to imitate oak, walnut, etc. Floors and ceilings are generally painted. The floors may also be covered with linoleum.

With the increased purchasing power as a result of the war, the demand for a better class of woodwork has grown, and in the future it is expected that the importation of a better grade of lumber will be stimulated.

For heavy construction work, ship decking, and other shipbuilding material, some limited quantities of American softwoods have been imported. Southern pine, sold under the name of pitch pine, is used to some extent for dock construction and shipbuilding, but has not, except in rare cases, been used for flooring or ceiling. Some southern pine has also been used for finish, for railroad cars, and also for furniture. It is well known in Norway.

Douglas fir, known in Norway as Oregon pine, has only been imported in small quantities, when it was taken in squares of about 17 or 18 inches and in lengths from 40 to 60 feet. The squares were resawn in Norway into lumber mainly for ship decking. Many people in Norway seem to be of the opinion that Douglas fir can not easily be obtained in smaller sizes, which probably is the outgrowth of an unwise selling policy on the part of the people in Europe selling this material. It is evident that it would increase the use of Douglas fir in Norway if the importers could be educated not to order wider stock or longer lengths than they need for their trade. Some Douglas fir planks have been taken at times. This stock has been reexported from other European ports, and very few shipments of lumber has been made from the Pacific coast to Norway.

California redwood is not well known in Norway, but has had a limited use for decking for yachts and pleasure boats, because it is lighter than southern pine, Douglas fir, and other similar woods. As redwood is soft and easily shows wear, it is customary to cover the decks with tarpaulin. Nothing whatever was known by the Norwegian lumber importers in regard to the properties of California redwood, except that it is light in weight and has a reddish color.

No other American softwoods seem to be used in Norway, and evidently no efforts had ever been made by the American exporters or their agents to enlighten the Norwegian importers as to the usefulness and properties of American woods. The importers have had to make suggestions themselves and to find out for what purposes the various species of American woods would be most suitable.

The building of boats and water craft in Norway is an important activity where a great many of our woods could be used, and the same applies to other industries. On account of this lack of information several species of American woods have been tried for uses for which they were utterly unsuited. These mistakes may in many cases entirely spoil the market for such species for other purposes.

No foreign woods are used in Norway for paving blocks, and imported shingles are unknown.

There has been one serious drawback in connection with marketing American lumber, namely, that the Norwegian carpenters, painters, etc., generally use defective materials and methods in varnishing foreign lumber, and on account of this the grain does not show up to advantage. It might be a good plan, not only in Norway but in other countries where similar conditions are present, for the American lumber exporters to cooperate with the exporters of varnish in advocating better methods of polishing, as this would no doubt increase the usefulness of American lumber.

PRICES AND FREIGHT RATES.

Practically shut off during the war from several of the most important sources of supply, the Norwegian stocks of imported lumber were very low during the latter part of the war, and the prices advanced so greatly that the use of foreign lumber was almost prohibited. Since the armistice was signed prices have decreased to some extent, but are still so high that they must be termed as abnormal. Under these circumstances it is not believed that it would be of any value to give the present price level, as the prices change from one week to another. The prewar prices do not convey anything of interest, since there is only a slight chance that the prices of imported lumber in Norway will reach the prewar level in the future. The same also applies to the freight rates.

The importation of lumber into Norway is greatly facilitated by the many direct steamship lines which connect Norway with most of the important lumber-producing countries. Norway has direct steamship connections with the east, south, and west coast of the United States; the east and west coast of South America; West Africa; with several countries in Asia, and nearly all the European countries.

The freight rate from the United States to Norway was generally 60 cents per hundred pounds before the war. During the war the rates varied from $2 to $3.30 per hundred pounds.

There is no duty in Norway on rough and planed lumber or veneer.

METHODS OF IMPORTATION.

The market for imported lumber is so small in Norway that there are no resident agents handling imported lumber. Most of the imported lumber is sold through foreign agents, Danish, English, or German. Considerable quantities are also purchased from large importers in other European countries, who distribute stocks to the smaller lumber importers in Norway, Sweden, Finland, etc.

The Danish lumber importers seem to have obtained a strong foothold in Norway, which is probably due to the fact that they were able to extend credit to some of the Norwegian importers before the war. German and English importers and agents have also shipped considerable quantities of foreign lumber to Norway on the regular liners plying between Norway and these countries.

Although the importers favor direct dealings with the exporters in the producing countries, it is questionable, from the exporters' standpoint, whether direct shipments are advantageous, as the Norwegian orders are generally small and on this account often cause a great deal of trouble.

It is believed that the Norwegian business should be handled in the regular way, through agents and not by direct shipments, unless special conditions are present. Another matter is that the agents should be better supervised by the exporters to prevent certain practices which often hamper the sale of American lumber. If an agency in Norway handling other commodities could maintain a branch in charge of a competent person handing American lumber and lumber products, it is believed that this arrangement would be more satisfactory than the practice of selling American lumber to foreign agencies, as at times considerable dissatisfaction has been experienced on the part of Norwegian importers in dealing with foreign agents. These local agents could no doubt better cover the field than foreign agents.

Several complaints were heard from the importers in regard to unsatisfactory methods followed by some foreign agents handling American lumber. It was pointed out that some agents would not submit the original invoices issued by the American exporters, but would invoice the lumber themselves, whereby these agents would be in a position to tamper with the grades and to raise the prices at will. It was even reported that some agents charged the importers a commission to guarantee delivery in accordance with the contract. These practices naturally hamper the sale of American lumber. It must be termed a "hold up" for the agents to charge an extra commission to guarantee delivery of the parcels which they sell. No reputable agent would naturally care to handle the stocks of unreliable exporters. It is no wonder that the Norwegian importers desire more satisfactory methods of acquiring American lumber.

Another example of unsatisfactory methods in selling American lumber was reported in one case where the agent, having practically a monopoly of the selling of one or more kinds of lumber, simply stated to the Norwegian customers that if they did not buy a certain foreign wood from them they could not have the particular species of American lumber for which they had the sole agency. It is easy to see what effect these methods would have on the sale of American lumber.

Selling through agents will nearly always prove to be the most satisfactory way of handling lumber for export, especially American lumber, as the American exporters usually have difficulty in keeping in close touch with their customers abroad. It seems that the American exporters in general in the past have failed to exercise any effective supervision of the way in which their lumber for export has been handled.

The system of retailing lumber in Norway generally seems to be the same as that in the other northern European countries, namely, to make as large profit as possible on what little is sold instead of distributing the profits on a larger quantity.

There has been little effort on the part of the importers in the past to enlighten the public on the use of foreign lumber by advertising any special kind of wood. Often dealers do not have any clear idea of the most suitable uses of the lumber which they handle, and the value of proper advertising is not generally understood by the importers. The character of advertisements of the lumber dealers generally is, for instance, "All kinds of foreign lumber, cheapest and best at ———." Efforts to enlighten the public on the usefulness of any particular species of lumber is seldom or never seen.

On this point it is believed that the American exporters could assist the importers in a very effective way, as modern methods of advertising are not generally seen in Norway, at least not in connection with lumber sales, and good results may be expected. Most of the importers seem to be very conservative and prefer to follow the methods established years ago, although some of them expressed their willingness to cooperate with the American exporters if any efforts should be made to push the sales of American lumber in Norway.

A good example of what can be done by energetic efforts in even so small a country as Norway was seen during the war, when American enterprise entered this field and advocated the use of American lumber. In a short time several important contracts were obtained for interior finish, hardwood floors, etc., for both public and private buildings. It was even found that southern yellow pine lumber could be brought into Norway and successfully take up competition with Norwegian pine and spruce, in spite of the heavy freight rates, when a moderate profit was charged by the importer.

POSITION OF SOUTHERN PINE.

It is interesting to consider a comparison between the prices of southern pine No. 2 common and those of unsorted Norwegian construction lumber sold for local use (the local unsorted grade is somewhat inferior to the unsorted grade for export). The following are prices per thousand feet, quoted in the winter of 1919, for lumber c. i. f. Christiania. It is seen that southern pine was even cheaper in the wider sizes than Norwegian pine.